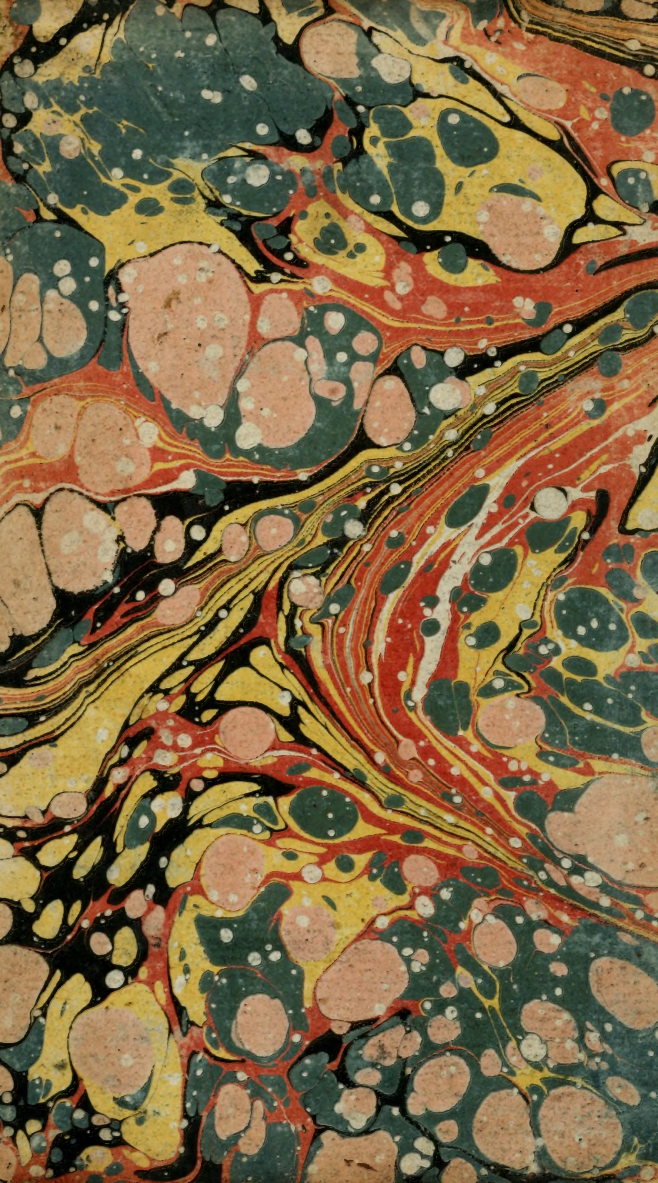
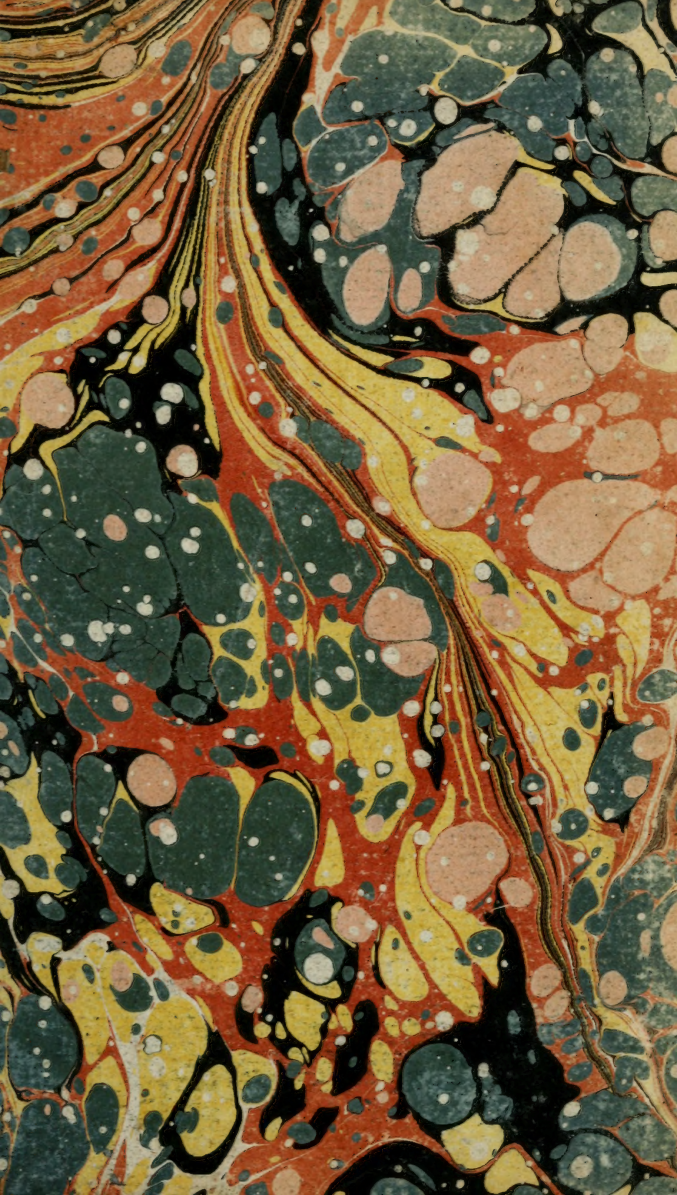








[920091]

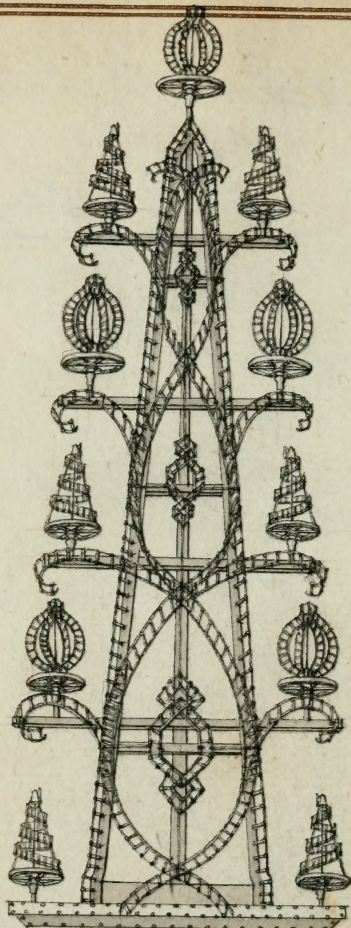
Keep



Digitized by the Internet Archive  
in 2009 with funding from  
Research Library, The Getty Research Institute

Dedicated to Sir Wm Congreve  
Controller of the Royal  
Laboratory Wexham, whose  
son succeeded him in that office  
& invented the Congreve rocket

Presented to H. C. Cleaver Esq  
by  
Thos. S. Chispe



To  
**MAJOR CONGREVE.**  
*This Second VOLUME of*  
*Artificial Fireworks is*  
*humbly Dedicated by*  
*his most Obedient*  
*& devoted Servant*  
*John Muskall.*

## EXPLANATION of the FRONTISPIECE.

**Illuminated Obelisk.** the Sides are composed of fir Battens, about 3 inches broad and 1 Inch thick, with cross pieces at proper intervals, both to support the sides and to fix the Center Illuminations on.

The Scrole work and Branches consist of flattened Iron, on which the Specchis are tied and communicated, and are fixed on to the wood work with wire staples; these must be communicated to the Specchis which form the Outline of the Obelisk.

The Pedestal must be in one piece of half inch stuff glued together; and supported by two battens nailed on behind — this, and also the Sides should be painted in Distemper of a light stone Colour; with the lines and shades formed on the Pedestal, which must have holes bored to form the Outline with Specchis.

There must be a Center Post to fix the Obelisk to by wood screws through the middle of the cross pieces of the Ironwork — the Arms with the spindle irons for the Globes and Spirals. Wheels must be screwed into blocks fixed behind the projecting bars, which are all communicated behind; then the Globes and Spirals put on their Spindles; and the Piece raised upright must be secured by ramming in the earth tight round the Post — with a long Brace behind.

Now

Now the Pedestal must be fixed to the Post with screws — in the center of the Pedestal, should be a flat spiral Wheel 4 feet in diameter, to contain 12 four ounce wheel cases drove with strong white fire, the same as for the Globe and spirali Wheels, which have only 6 cases each, one to burn at a time; the diameter of these Wheels is 2 feet — two cases to burn at a time on the flat spiral Wheel, whose spindle iron must be fixed firm in the center of the Pedestal or Die — and then the whole communicated together so as to catch fire all at once.

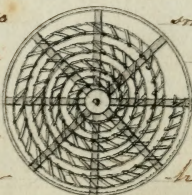
In the Room of the flat spiral Wheel, is inscribed the Address Dedicatory, being the only proper place.

All the Specchies of the Globes and spirali Wheels, and the flat spiral Wheel for the Pedestal, to be in yellow fire.

The first Illuminations or Specchies on the Scrolwork and Branches, and those which form the Outline of the Obelisk and Pedestal, to be in blue fire.

Flat spiral Wheel  
for the Pedestal —

The Sketches are too small to put the cases on the Wheels; but in the Explanation for Wheels in Aure fire, it is hoped the Method will be easily understood: This Piece has never been ex-



hibited; and a full Description is intended to be given of it in Vol. 3: As the Communications belong to the higher Order.

# Artificial Fireworks.

Specchies of all Natures.

- 1<sup>st</sup> Specchie for Illuminated Wheels; white.
- 2<sup>d</sup> Low Specchie for Fire Illuminations; white.
- 3<sup>d</sup> Specchie for Fire Illuminations; Green.
- 4<sup>th</sup> Large Long Specchie for the Salamander; Green.
- 5<sup>th</sup> Specchie for Illuminated Wheels; Yellow.

To Roll the Cases for the three first Natures, the Formers may be turned out of Beech or Ash wood, and is only a plain round Stick, Viz.  
*Sketch of the Former.*



The Diameter of the Former is  $0,35$  of an inch; and its Length about six inches, and ought to taper a very little towards one end; there must be a number of these Formers.

The Cases should be made of the toughest and whitest table paper — One Sheet cut broadways of the half Sheet, makes 6 Cases.

A sufficient Quantity of paper must be cut out,

2.

out, as it requires to have thousands of these  
Speeches in Store.

*Pattern of Paper for Speeches.*

5 in.

11 In.

In order to save the Tables, it will be proper  
to have six boards two feet and a half long,  
half an inch thick, and the breadth of the  
Plank suppose 8 inches.

The Papers are to be laid down upon  
the Boards in the following manner for  
Pasting, *Viz.*

*Sketch of the Papers laid down on the*



*Boards for Pasting.*

The papers laid down according to the Sketch,  
the left hand fingers must be stretched on the  
papers to keep them steady, while they are  
pasted with the brush in the right hand; the  
edge of the last paper must be pasted equal  
with

with the rest about a quarter of an inch, as may be seen by the dotted line on the last paper in the sketch.

The papers being pasted must be rolled up immediately one after the other,

Sketch of the Paper & Former laid down for rolling.



Now according to this sketch, the paper being laid at full length on the table, place the former on the paper at about  $\frac{1}{3}$  of the length; then the dry end must be brought over the former and creased close all along to the former with the fingers, then roll up one turn, and laying the palm of the hand upon the former at top, roll it up quick and tight, setting the pasted edge close with the finger or thumb nail, then pull off the case and fling or put it into a tray to dry.

This Work is very quick, as one Man may Roll from 1500 to 2000 in a day.

St.

4. It will be necessary to have six persons at least for this work, vizt: three to attend to lay down the papers and paste them; and three, to Roll them up.

A large Quantity of these Cases should be rolled, at least forty or fifty thousand; as Whole and fixt Illuminations take up great Numbers of them.

When the Whole are completely Rolled and dry, they must have a Bottom formed to them, which requires the following Articles, vizt: A former turned a little less, than the former for Rolling; Small Mabe or squares of Beech wood about 3 inches square and an inch and a half or two inches thick; flat pointed prickers and small Mallets.

All the six people must be employed at this work, as it is more tedious than Rolling.

The Method is to take a case and put a small former into it not quite home to the other end, about half an inch from it, and with the prickers begin to turn down the inward folds, proceeding to

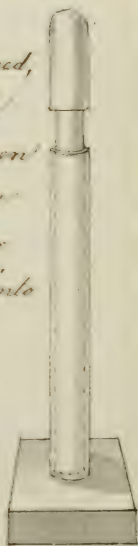
to the outward, I shall endeavour to explain  
the manœuvre by a Sketch; viz.  
Method of Making a Bottom to the Cases.



According to this Sketch, the two points are  
to be turned down last which forms a kind  
of square at Bottom; or they may be turned  
regularly in, all round, at Bottom, in the  
same manner as for Portfire Cases; it is  
immaterial which Method is used, provided  
the Bottom is entirely closed.

As soon as the Bottom is formed,  
the Case must be set on the Beech  
block, and five or six strokes given  
with the Mallet, to set the paper  
close; then take out the Former  
or Setter, and chuck the Cases into  
trays or baskets.

When a number of them, as  
two or three baskets full, have  
been bottomed, they must be cut  
to a proper length, which will  
require two or three people to



Cut

6.

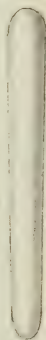
Cut them, while the others continue to form Bottoms.

For cutting them to an equal length, these small articles are required, viz, a gauge; a small beech pin for opening the ends of the cases after they are cut; and a pair of good scissors.

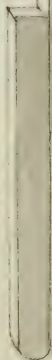
The lower part of the gauge, is a small piece of beech or fir about half an inch square and 4 inches long, the edges rounded off a little; at the back is a slip of tin half an inch broad nailed on with tacks; the length from the top of the stick to the top of the tin is  $3\frac{3}{4}$  inches.

The small beech plug is about 3 inches long, and its diameter equal to the diameter of a former for rolling the cases on; only this plug is made taper towards one end, to facilitate its going into the case.

To



Sketch of the small beech plug for opening the ends of the cases.



Sketch of the gauge for cutting the cases to an equal length.

To Use the Gauge; is to take a Case and putting its bottom on the top of the stick close to the tin, cut it off even with the top of the tin, then the Case will be  $3\frac{3}{4}$  In; long.

As the cutting with the wire compresses or flattens the Case at top, it is necessary to introduce the small beech filing, to open them to a fair round; for receiving the tin funnel when they come to be filled.

As the Cases are cut and opened, sling them into Baskets, till the whole number is completed:

Compositions for Specchis; and first the white for Illuminated Wheels.

Composition. lb. oz.

Mealed Powder - - - - - 1:0.

Salt Petre - - - - - 4:0.

Sulphur - - - - - 2:0.

This proportion to be weighed out; then sifted four times through a hair sieve and it will be fit for Use

White

8.

# White Specchie Composition for First Illuminations.

## Composition.

|                          | lb. : oz. |
|--------------------------|-----------|
| Mealed Powder - - - - -  | 1 : 0.    |
| Salt Petre - - - - -     | 9 : 0.    |
| Sulphur - - - - -        | 2 : 0.    |
| Antimony crude - - - - - | 1 : 0.    |

This Proportion to be weighed out; then Sifted altogether four times through a hair Sieve.

# Blow Specchie for First Illuminations.

## Composition.

|                             | lb. : oz. |
|-----------------------------|-----------|
| Salt Petre - - - - -        | 2 : 0.    |
| Sulphur - - - - -           | 4 : 0.    |
| Antimony prepared - - - - - | 8 : 0.    |

To Mix this Composition: first, put 3 ounces of Camphire on a table and pour a few drops of Spirits of wine upon it, which will make it pulverize easy; then add the Sulphur to it and Mix them well together; then add the Petre and Antimony, Sift altogether four times through a hair Sieve; and it will be fit for Use.

The preparation of the Antimony is a  
Chemical

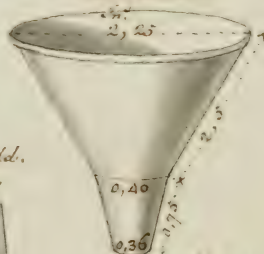
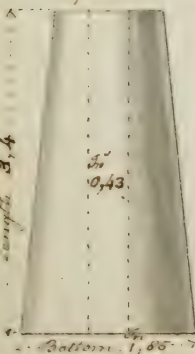
Chemical process known only to *L. Charles Frederick*.

*Method of Filling Specchi Cases.*

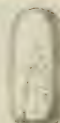
They are filled by One general method, which requires, a small Beech Mould; a tin funnel; an iron Drift with a head consisting of two pound of lead at top; a small square Box made of Tin to contain the Composition; and a tin ladle to put the Composition into the funnel with. Each Filler must be supplied with the above Articles. *Tin Funnel.*

*Beech Mould.*

*Top 1, 1, 7*



*Tin Shovel.*



*Iron Drift - Length 8, inches*

*0, 5*

Besides the foregoing Articles each man must be furnished with a sharp pointed pickpen.

All things ready, we proceed to Shilling. first taking a Case and put the open end in at the Bottom of the Hould; then shove it upwards, and set it on the table; next put the nose of the Funnel carefully into the top of the Case setting it tight in; this must be done by turning the funnel round, not by forcing it right down — (the neck of the funnel should only go about  $\frac{1}{2}$  or  $\frac{3}{4}$  into the Case) which leaves just room for Priming).

— then the Iron drift to be put in and held steady with the left hand; with the right hand take up a ladlefull of Composition and put it into the funnel; return the Ladle into the Composition Box — with the right hand take hold of the lead at top of the drift, and with the left hand hold the Back Wheel steady, let the Drift be moved up and down pretty quick, pressing somewhat strongly on the lead

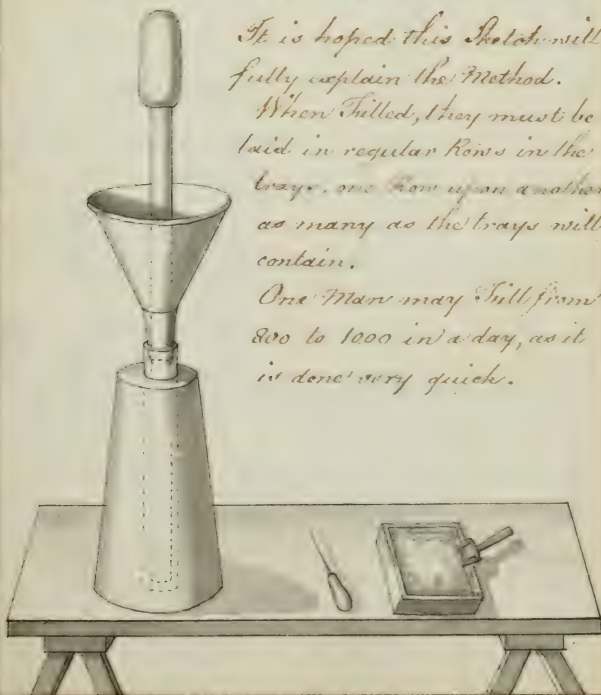
Will

'till the Case is full, which may be easily known by the end of the drifts chocking in the neck of the Funnel—then lay down the drift, and take out the Funnel, holding it over the Composition Box and with the sharp pointed pricker clear out the Composition—push out the Case in the manner it was put in, and lay it carefully in a flat tray.

It is hoped this Sketch will fully explain the Method.

When Filled, they must be laid in regular Rows in the trays, one Row upon another, as many as the trays will contain.

One Man may Fill from 800 to 1000 in a day, as it is done very quick.



Some Cases will be spoiled in Filling; much depends on setting the Firment properly in at first.

When the whole Number of Cases are Filled they must be primed with mealed powder mixt up with gum water to a middling stiff paste—1 lb of Gum arabic dissolved in a gallon of water will be strong enough.

To prime them, is only to take a little paste up by dipping the end of the middle finger into the tin or earthen pan, and pressing it well into the top of the Case till it is full.

As they are primed, they must be laid in the trays row upon row, till the trays are full, then let them remain a week to dry thoroughly.

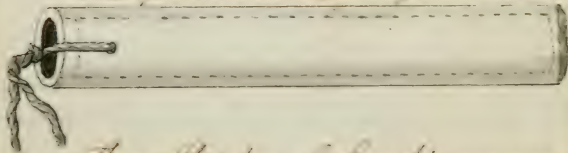
When dry, they must be strung; first there must be a great number of strings of coarse twine cut, each string about six inches long, then each person must have a parcel of strings, a small piece of fir and a sharp pointed pricker, then the method is, to take a specimen in the left hand, and holding the end of the fore-finger hard.

hard against the priming, to prevent its being forced out, lay the primed end on the piece of Fir and with the pricker pierce right through the middle of the base at about  $\frac{3}{10}$  of an inch below the top, then run a length of twine thro' the hole, and bringing both ends even together at top, twist the ends together between the finger and thumb, (this is done to prevent the string from falling out) when string fast then in Baskets to be carried into Stores where they may be put into Barrels with covers, with tickets specifying their Nature and Number.

*The Specchi Bomb.*



*The Specchi Bomb & string with twine.*



These Sketches of Specchies are exact to the diameter; but the paper would not allow the full length.

There is another Method of stringing the Specchies

Specchis, which is only to be used when they have not been strung in the first Method, and is to be done after the Specchis are fixed on the Wick, this is the same as stringing Cases for tying down the Leaders. Examples will be given, as Yellow Specchis are always strung in this second Method.

### Large long Blen. Specchis.

The Cases are made of Tube paper and the Composition the same as for the smaller kind, all the difference consists in the diameter and length, as a full sketch of these Specchis will be given; it will be easy to direct the Farmer; Drifts and Tunnels in proportion for them.

### Yellow Specchis.

The Cases for these are made of C.P. Cartridge paper, cut out in length 7 $\frac{1}{2}$  Inches and 4 inches in Breadth each — the Diameter of the Boath Farmer is  $\overset{\text{In}}{0,35}$ , and its length 6 Inches,

These

These papers are to be laid down on fir Boards and pasted in the same manner as the foregoing, only bridge paper requires more time to soak 4 or 6 or 8 minutes after they are pasted, before they can be rolled. The Method of Rolling is exactly the same as for the tube paper Cases.

The Method of forming a Bottom to these Cases differs in not being turned in, but choked at one end having a small button of paper put in, to help to fill up or stop the hole, and the Chokes are not laid down with twine, but left as choked with the Line.

### Composition for Yellow Speeches.

lb: oz.

Healed Powder - - - - - 0:15.

Salt Petre - - - - - 1:0.

Sulphur - - - - - 0:8.

Yellow Amber-powder - - - 0:8.

This Proportion to be weighed out, then sifted altogether is times through a hair Sieve.

The Method of Filling is the same as

before.

16.

before light with an Iron drift loaded with lead at top and a tin funnel, only there is no occasion for a Beesh Mould, the cases being strong enough to bear Filling without it.

The whole length of Case as cut for Filling is  $3\frac{1}{2}$ ; and the length taken up by the Composition  $3\frac{1}{2}$  — Priming  $0\frac{1}{2}$  —

These Specchies are only used for Illuminated Wheels; and it is remarkable, that this Composition Filled in tube paper Cases loses its yellow colour.

The Specchie of 3<sup>rd</sup> Inches long burn the time of the Wheel Case of  $8\frac{1}{2}$  long diam with Brilliant — the Yellow Specchie keeps the same time.

The Blue and White Specchie's for First Illuminations, burn the time of 7 Cases nearly, if there are any Wheels, as Spirals, Illuminated Globes &c, the Specchie must be timed to the Case, that the whole may conclude together.

Sketches

Sketches of Specchio; exact Proportion<sup>17</sup>.

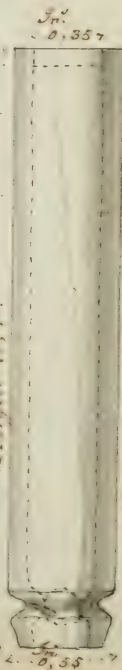
For Blot Specchio for Fine Illuminations & for White Gilt.  
N.B. White Specchio for Illuminated Works are only 3/4 in. long.



Large Blot Specchio for the balance of Piece.



Length 3, 1



Yellow Specchio for Illuminated Works.

## Explanation for the <sup>2</sup>Wheels.

The Speeches for the Upper Wheel may be white or yellow at pleasure; the upper Spokes are bored with a Center-bit about  $\frac{1}{4}$  of an inch deep, to receive the ends of the Speeches dip in hot glue and set in. — this is the form of the upper and  <sup>Upper</sup> Spoke. Under Spoke — this Wheel is properly  <sup>Under</sup> Spoke. Led with the Communications to go into the two first Cases, that both they and the Speeches may take fire together — All the Speeches work of the Wheel must be completed, before the Cases are tied on.

For the Under Wheel; the Speeches are tied on with coarse twine upon the iron scales, then pasted with double tube paper all over the iron and twine and the lower part of each Speech — the Strings of the Speeches on one whole are represented open, as the whole ought to be — till it is communicated or Led. —

The Speeches for this may be white, yellow or Black at pleasure.



# Explanation for this Piece.

All the Circle Work is made of Iron Platted; and consists of four Pieces, each Diamond Figure is in one Piece and has two fir Battens which go right across it both to preserve the Figure, and to fix them on the Post with wood screws; the Bouquet at Top is turned on to the Post.

The Specchis for the Circle work are all tied on and stand horizontal or right forward; they may be Blue or white.

The Specchis for the Wheels should be yellow; there are two hoops round each Wheel, one for the Specchis and the other for the Cases.

Brilliant Compositions must not be used for the Cases for illuminated Wheels, as the Glare of the Specchis takes off it's effect; they must be drove with strong white fire.

These <sup>up</sup> Sketches are only intended to show the different methods of Fixing the Specchis on the Works; the rest will be fully explained in due Course.



Explanation for the GR and Crown.

The Crown is in one piece, viz<sup>t</sup>.  $\frac{1}{2}$  Inch  
 Fir glued together, and the Letters the same,  
 the Drawing should be first made on Car-  
 bridge paper, by which pattern the Crown  
 and Letters must be cut out.

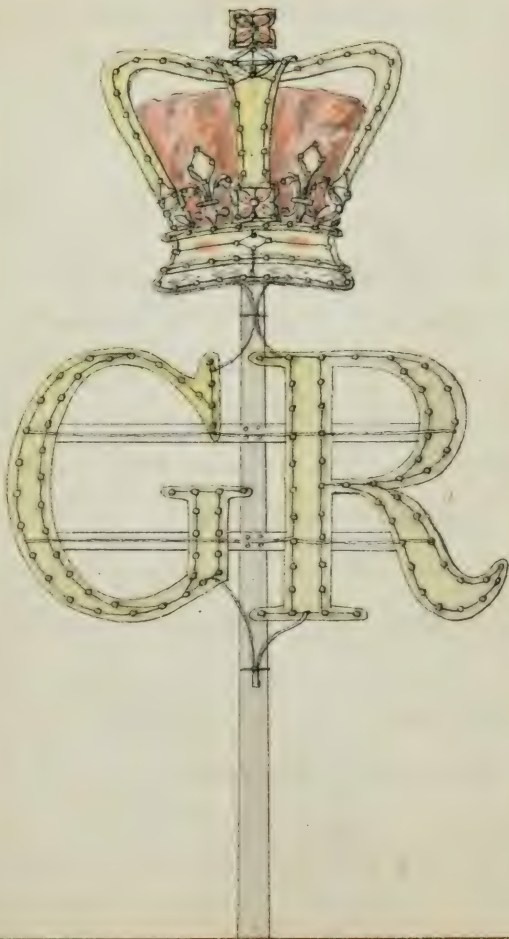
The Letters must have two fir battens  
 right across behind, both to support, and  
 fix them to the post or upright.

The Crown and Letters must be painted  
 in proper distemper colors; and then being  
 marked out for the Speeches, all the holes  
 must be Bored with a Gunter bit, to glue in  
 the Speeches which may be white or blue.

For the Communications, the sketch, it  
 is hoped, will sufficiently explain the Method.

These may stand on a pedestal in the  
 Center of a Triumphant Arch, or on the top  
 of the Arch, or other proper device.

We have no Yellow Speeches proper for  
 first Illuminations — the only one known,  
 cannot be used, on account of darkness.



Formerly, Portfires cut into proper Lengths, were used for Illuminations, which was succeeded by a kind of white Specchi of an inferior sort, the present practice justly employs the kinds as before explained.

There are yet wanting, Yellow Specchis for first Illuminations; Red and Green Specchis; Specchis of a full Blue; for those we have burn only of a light Sky Colour, which appears to me rather as the effect of the smoke proceeding from them, than any real tint of the flame.

Probably, Experiments may discover the other Colours, if it should be thought proper to try for them.

The Yellow Specchis burn of a good Color, but the Composition does not answer in tube paper Cases.

# LEADERS of all Sorts ~

First tube paper Leaders of three sizes; viz: Small; Middling and large.

Secondly, Cartridge paper Leaders; Small, Middling and large, the Large are used only for Experiments.

The Wire for Rolling the Small tube paper Leaders is  $0,15$  <sup>in.</sup> diameter — for the Middling Size the Wire  $0,2$  <sup>in.</sup> diameter — for the Large the Wire  $0,25$  <sup>in.</sup> diameter.

The tube paper for Leaders ought to be chosen of the whitest and toughest sort; one Sheet of paper lengthways of the half Sheet, makes 10 Small Leaders; 8 Middling Leaders and 6 or 7 Large Leaders.

Leaders of the length of the half sheet of paper only, are of equal thickness from end to end; but it is necessary to have Leaders of the whole length of the sheet of paper, made with a trumpet mouth at one end, to receive the small end of each other for long communications.

To

## To Roll tube paper Leaders.

First the Wire ought to be clean and very straight; and it is necessary to have a smooth fir Board about 3 feet long and the breadth of the Plank — the Board being pasted over lay down 3 or 4 slips of the paper on it, and paste them over quick with the Brush; take the Wire and paste all over the Body of it, then raise up one of the Slips of paper and lay it close to the edge of the Board, lay on the Wire equally upon it, and bring the edge next to you up over the wire all along, pressing it close with the fingers, then Roll up the paper smooth and quick; pressing down the outward edge all along with the fingers adding a little fresh paste if necessary hang the Wire by the Ring on a nail near hand, and draw off the Leader by smoothing it down with both hands; then lay the Leader in a clean flat tray, proceeding in like manner to Roll each Leader with all possible quickness.

Tube

Tube paper will not admit of more than 3 or 4 slips to be laid down at a time, as the paste makes them so tender, as to be not easily drawn off the wire, if they lay too long pasted; for which reason the utmost dispatch is required in making them; in laying them in the trays to dry, care to be taken that they do not touch one another.

The long trumpet mouthed Leaders, for Communications, are Rolled exactly in the same manner; but at the proper length on the wire, there is a cone of solder about  $\frac{1}{10}$  of an inch more in diameter at top; than the thickness of the wire, to form the mouth of the leader on; the Sketches will explain this.

#### Cartridge paper Leaders.

The Wire for Rolling the small sort on is  $\frac{1}{16}$  diameter and 3 feet long.

For the middling sort  $\frac{1}{8}$  diameter and 3 feet long.

For the large sort for Experiments, the Wire  $\frac{1}{4}$  diameter and 3 feet long.

All the Wires have a ring turned at top.

All

All Cartridge paper Leaders are made with a trumpet mouth.

Cartridge paper Leaders to have two turns of paper round the wire for thickness, and tube paper leaders four turns; so that, by putting a small slice of paper twice or four times round any of the wires, it will be easy to determine the breadth of paper for each Leader.

Formerly the different Laboratory Works furnished a sufficient quantity of Slips for Leaders without cutting whole sheets.

The Leaders are made the whole length of the sheet of paper, which length answers to a length of Quickmatch— if made longer they would not answer; and if shorter, much of the Quickmatch would be cut to waste?

Three or four dozen of the Cartridge paper Slips may be laid down at a time and well pasted, they ought to lay 8 or 10 minutes to soak before they can be rolled; the method  
of

if Rolling them is the same as for tube paper Leaders, only that the Cartridge paper being more stubborn requires more pains and time to lay the edges down close; when drawn off the wire, they may be laid on spare tables, and when half dry, they may be taken off the tables, and laid loose in a parcel, in some convenient place, to clear the tables for more.

The Leaders when Rolled, require about a week to dry thoroughly, and for three days they should be exposed to the air to dry the insides — 3 or 4 thousand of each Nature should be Rolled, as large Works take up great numbers of them; and it is best to make a Stock for three or four Years.

Four people may be employed at this Work, vizt. two, to Roll tube paper Leaders; and two, to Roll Cartridge paper Leaders; and as parcels of the Leaders become dry enough, two may continue to Roll wet, and the other

two to Roll dry.

Dry Rolling is performed, by pulling the wire through the Leader in the same manner they were Rolled at first, and then Rolling the Leader from end to end with a Rolling Board five or six times each for Cartridge paper Leaders; and for tube paper Leaders three times is sufficient; when the Leaders are dry Rolled, they may be laid on tables or in trays, each sort by themselves.

A quantity of the Leaders being dry Rolled each sort must be made up into parcels containing 100 in each; a slip of paper being put round the middle to bind them and tied lightly round with two or three turns of coarse twine, then they may be put in store.

It is necessary to dry Roll the Leaders, both to make them smooth and straight, and likewise to make the insides clear, that the quickmatch may go freely through.

The

The Leaders in drying contract a curve form and appear rough and unsightly, which is rectified by dry Rolling; but the wire ought to be very clean.

Leaders with trumpet-mouths are a direction to put in the wire for dry Rolling; for here the end of the wire must be put in at the trumpet-mouth; and pushed through about half an inch beyond the small end of the Leader; but for short tube-paper Leaders without mouths, it is necessary to observe the outward edge of paper all along, in order to put in the wire at the right end, for if the Leader is put on the wrong way, the Dry Rolling will open the paper and spoil the Leader; a little practice will determine this.

When one trying to Dry-Roll any Leaders, they stick on the wire and will not come off easily, it is a sign that they are not dry enough; in such case it will be proper to expose them for a day or two longer to the open air.

Having it is hoped, given very plain  
Instructions

Instructions for making Leaders; it may next be proper to consider their application.

First: short tube paper Leaders without mouths, these are used for communicating or leading from one Case to another for small Truilonics and vertical Wheels consisting of One or two ounce Cases; and for leading Blue or white Speech Illuminations fixt, or on Wheels.

Second; the middling tube paper Leaders Ditto; may be used for communicating the small Wheels; but are more generally used for communicating all kinds of Speech Mark.

Tube paper Leaders with trumpet mouths are only used for making long Communications for giving fire to the small Wheels; the large sort are seldom used.

Small Cartridge paper Leaders are used for small Wheels — the middling sort, for leading all kinds of Wheels and Regulated pieces above two ounce Cases; and for making long and short Communications; but not used for Speech.

The Large Leader for Experiments is not inserted here — its Length is  $2;9$ <sup>ft. 3 in.</sup>, and the exterior diameter  $0,35$ <sup>ft.</sup>, having 3 turns of paper. — They are made up into lengths of one or two hundred yards with a 4 Ounce Maroon at the end.

Small short tube paper Leader — Length  $17,2$ <sup>ft.</sup> . . .

Middling tube paper Leader — Length  $17,2$ <sup>ft.</sup>

Long tube paper Leader with trumpet mouth — Length  $1;10$ <sup>ft. 3 in.</sup> . . .

Small Cartridge paper Leader with trumpet mouth — Length  $2;3,5$ <sup>ft. 3 in.</sup>

Middling Cartridge paper Leader with trumpet mouth — Length  $2;3,6$ <sup>ft. 3 in.</sup>

plain Wire for holding short tube, paper Leaders & dry Rolling Leaders — Length  $3$ <sup>ft.</sup>

Wire with cone of solder for forming the trumpet mouths — Length  $3$  Feet.

One thing should have been observed before, viz<sup>t</sup> that every evening the pasting Boards should be washed clean, and the Hires washed and well dried.

As it is necessary to furnish a quantity of Leaders for long Communications, it will be proper to give the Receipt for Making the Varnish:

Gum Anima - - - - - 8.  
ox.

Asphaltum - - - - - 4.

Red Lead - - - - - 4.

Litharge - - - - - 4.

Linseed Oil 2 Gallons.

The Linseed Oil to be put in a large iron pot over a Charcoal Fire - the Gum Anima & Asphaltum to be pounded fine - the powders to be put in gradually and kept constantly stirred, the whole to Boil 5 hours.

To Use the Varnish, put some into an earthen pan and pour Spirits of turpentine on it, stirring it well till it is of the consistence of a Symp.

Put a small plug of fir into the trumpet mouth of the Leader to hold by, and with a brush dip in the Varnish go all over the Leader; lay the Varnished Leaders on Sticks in trays; exposing them to the Sun for a Week or 10 days.

# MARROONS.

Marroons are of several Sizes, viz: 2 drams; 4 drams; half Ounce; One Ounce; 2 Ounces; 4 Ounces and 8 Ounces.

The Formers are turned out of Beech-wood, and the Bodies are made to taper a small matter.

The Cases for the 2 drams; 4 drams and half Ounce; may be made of indent or any waste paper that is stiff enough — for the other natures it will be best to make the Cases of Cartridge paper; 3 turns of paper round the former will be sufficient.

The Formers are turned out of Beech-wood, and are according <sup>to</sup> the following dimensions for each Nature.

To Roll the Cases; the papers are laid down upon a Board in the same manner as for Speck Cases; about half an inch of each allowed for pasting, allowing time to work; then Rolled up on the former, the edge secured close with a little fresh paste, then set an one end to dry.

*Dimensions*

# Dimensions for the several Natures of Marroon.

2 Dram Marroon Covered with Composition  
total diameter - - -  $\frac{7}{16}$  in.

$\frac{7}{16}$  in. <sup>th</sup>  
 { Breadth of paper cut out, indent or cartridge paper - 1, 125  
 { Length of paper cut out - - - - - 5, 000  
 Diameter of Former - - - - - 0, 500  
 Exterior diameter of base, Rolled - - - - - 0, 625.  
 Thickness of Composition - - - - - 0, 100.

4 Dram or Quarter Ounce Marroon.

$\frac{7}{16}$  in. <sup>th</sup>  
 { Breadth of paper cut out - - - - - 1, 750  
 { Length of paper cut out - - - - - 8, 000  
 { Diameter of Former - - - - - 0, 775  
 { Length of Body of Former - - - - - 2, 000  
 Exterior diameter of base Rolled - - - - - 0, 900

Half Ounce Marroon.

$\frac{7}{16}$  in. <sup>th</sup>  
 { Breadth of paper cut out - - - - - 2, 775  
 { Length of paper cut out - - - - -  
 { Diameter of Former - - - - - 1, 075  
 { Length of Former - - - - - 3, 125  
 { Length of the Handle - - - - - 3, 500  
 Exterior diameter of base Rolled - - - - - 1, 175

1 Ounce Marroon.

$\frac{7}{16}$  in. <sup>th</sup>  
 { Breadth of paper cut out - - - - - 3, 250  
 { Length of paper cut out - - - - - 1, 750  
 { Diameter of Body of Former - - - - - 1, 400  
 { Length of Body of Former - - - - - 3, 550  
 { Length of the Handle - - - - - 3, 550  
 Exterior diameter of base Rolled - - - - - 1, 500

37.

2 Ounce Marroon.

Ft. In. 10.

|                                  |           |
|----------------------------------|-----------|
| Breadth of Paper cut out         | 0: 4, 0   |
| Length of Paper cut out          | 1: 6, 0   |
| Diameter of Body of Former       | 0: 1, 656 |
| Length of Body of Former         | 0: 4, 0   |
| Length of the Handle             | 0: 2, 0   |
| Exterior diameter of Case Rolled | 0: 1, 72  |

1/2 Ounce Marroon.

Ft. In. 10.

|                                  |         |
|----------------------------------|---------|
| Breadth of Paper cut out         | 0: 4, 5 |
| Length of Paper cut out          | 1: 8, 0 |
| Diameter of Body of Former       | 0: 2, 0 |
| Length of Body of Former         | 0: 6, 0 |
| Length of the Handle             | 0: 4, 0 |
| Exterior diameter of Case Rolled | 0: 2, 2 |

8 Ounce Marroon for Review.

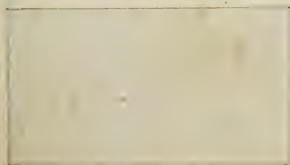
Ft. In. 10.

|                                  |         |
|----------------------------------|---------|
| Breadth of Paper cut out         | 0: 5, 5 |
| Length of Paper cut out          | 2: 0, 0 |
| Diameter of Body of the Former   | 3: 2, 5 |
| Length of Body of the Former     | 0: 5, 0 |
| Length of the Handle             | 0: 4, 5 |
| Exterior diameter of Case Rolled | 3: 2, 7 |

Sketch  
of the  
Former.

Pattern of Paper.

Case Rolled.



The Case being Rolled and dry, must have Bottoms formed at one end; which is done by putting a Case on the Former, and with a large flat pointed pricker turning down the folds of Paper square, then set the Case with former on a large wood Block, giving five or six smart strokes with a Mallet on the head of the Former to settle the end of the Case — take off the Case and fling it into a basket or tray, proceeding in the same manner to form a Bottom to each Case.

Next it will be necessary to have tin-measures that will contain the requisite of powder according to each Nature; then the Method is to set 2 or 3 dozen Cases upright in a box or tray, and put a measure of powder into each as they stand — One Man will fill as fast as 2 or 3 Men can form tops to them.

To form the tops; first take a Case and put in the former at top of the powder giving one or two gentle taps with the Mallet to  
Set.

39

Set down the powder a little; next with the flat pointed pricker, begin at the inward fold of paper turning it down upon the powder all round, but square, so to form the top into the same narrow as the bottom; then set the former at lope and with the Mallet give 2 or 3 moderate strokes, to set down the lope a little.

Thus far completed, they may be put in Boxes or trays, and the filling & forming tops continued, till the whole are completed and carried into store, then they will be ready for Woolding.

For Woolding, it will be necessary to prepare a large quantity of coarse twine; fine, middling and coarse packthread; and 2 or 4 pounder line, which must be all regularly rubbed with Kitt so as to miss no part; and as it is kitted, it must be wound on for sticks, in the same manner, as twine is usually wound for flying a Kite.

The Method of Kitting is very easy, tho' it requires time to prepare a quantity; the

End

End of the twine or packthread must be fastened to a round pin drove into a post; a piece of Kitt must be put into a bit of tanned hide to save the hand, then it is only rubbing on the string so as to cover as you go on for the length of the Room or place, then unhitch and fasten to a fir Stick winding up the kitted part thereon; Hitch again for another length, and so go on length after length till the Ball of twine or packthread is finished; and begin again with a fresh Ball, working about 2 Balls on a Stick.

This work should be done in Summer time, for the Kitt flies off in winter.

There must be four or six people employed at this Work to make any expedition; and when there is a quantity kitted; three may begin Binding, and the other three keep on kitting.

Course twine kitted is used for Woodding 2 dozen Marroons.

Thin packthread Lillo, for Quarter and half ounce Marroons.

Middling

Middling packthread; One & Two Cunce Marroons.  
Coarse packthread, for 4 Cunce Marroons.

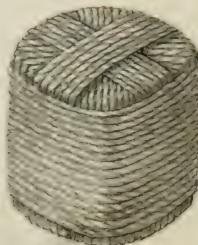
And the 2 or 4 Pounder Line for 8 Cunce  
Marroons. . . . .

With respect to the Method of Moulding,  
having thought of many different schemes  
for an Explanation, but none satisfactory,  
beg leave to observe, that the seeing two  
or three made with be the best explanation;  
or by unwinding one or two that have  
been moulded, and observing the turns  
of the Line; as it is a method very  
easily learnt.

Sketch of the Case  
complete with Powder.



Sketch of the Case  
moulded.



In this Sketch, the moulding is divided  
into 8 quarters - but they may be made  
with 6 quarters, at pleasure.

Next.

Next, it will be proper to explain the application of each Nature of Marroons.

1<sup>st</sup>. 2 dram<sup>s</sup> Marroons covered with Composition — supposing 3 or 4 thousand to be made and moulded in the common way; then each Marroon must be covered exactly all over with one single coat of pasted tube paper; pressed every where quite close, and put into flat trays for a day or two to dry.

In the mean time, it will be proper to prepare about a Gallon of Gum arabic water, about 3 lb of Gum to a Gallon of water, in this the Marroons are to be kept all over, then laid in trays so as not to touch one another, and to be turned 2 or 3 times a day till dry, which will require two or three days.

When dry, they must be firimed, take a sharp pointed firicker and make a hole at one end of the Marroon, so as  
to

to reach a little way into the powder, leaving the prick in; then take quick match of three threads, and cut a short piece, cutting one end of the short piece to a point, next take out the prick, and put in the piece of match point foremost as far as it will go; then cut off the match even with the top of the maroon, putting them in trays when primed, this work is done pretty quick.

The Maroons being all primed; it will next be necessary to prepare the Composition for covering them.

And first, it will be necessary to measure the quantity of gum water that remains after the Maroons are dipped; suppose two Quarts; to these two Quarts put one Quart of fair water, to reduce it to the proper strength for mixing up the Composition, which may be that given for Mould Sticks, or the following, viz.

44.

Viz. Composition for 2 dram Marroons.

Mealed Powder - - - - - lb: oz.

Salt Petre - - - - - 2 : 0.

Sulphur - - - - - 1 : 0.

Antimony - - - - - 0 : 8.

The Composition to be sifted altogether 4 times through a hair Sieve; then to be mixed in an earthen pan gradually with gum water to a middling stiff paste, not too wet, nor yet so dry as not to cohere together; As the method of mixing up the paste for Mould Stars &c. has been so fully explained in the first Volume, that it was thought needless to use too many repetitions.

To use the paste. take a marroon in the left hand, holding it lightly between the fingers, then take up a little composition on the end of the middle finger of the right hand, and rub it well on all over the marroon, not missing the least place; take

take up a little more paste and lay it equally on all over almost  $\frac{1}{10}$  of an inch thick all round, then Roll it between the Palms of the hands, and try it in the small wood Gauge, if it nearly fills the Gauge it is right, then Roll it all over in dry meal'd powder and Roll it between the hands to make it round, Roll it again in dry meal'd powder, and try the Gauge which should just go over it; As the Balls are thus finished, let them be laid in trays so as not to touch one another, and stand in the shade to dry for a fortnight or three weeks; then they may be put into Barrels with covers, for store.

It will be necessary each time, after the Ball is dip't in meal'd powder and Rolled between the hands, to scrape off the meal'd powder which sticks to the hands. There

There ought to be five or six people employed at this work, particularly one to mix up the plaster and oversee the work.

These are called Barbettes, and are employed sometimes for loading of large Rockets; for Air Balloons and other uses according to fancy.

Quarter Ounce Maroons are only proper to fix on the top of half pound Tourbillions, and at the end of small Cases.

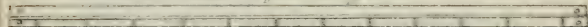
Half Ounce Maroons are used for one pound Tourbillions, and at the ends of Sun Cases to finish as a Battery.

One Ounce, Two Ounce and four Ounce Maroons are used only for Batteries; and are effect intended to answer the <sup>purpose</sup> intention of a Salute with Cannon.

Batteries

Batteries of Marroons require Rails of Fir and pickets or uprights pretty strong.

Fir Rail 13 feet long.



The Breadth of the Rail 3 Inches and the thickness 2 inches; along the middle is a groove  $\frac{1}{2}$  of an inch wide, and 12 short grooves leading from it, in which the tubes of the Marroons are to be fixed by wire Staples.

Eight of these Rails are sufficient for a large Firework.

Next it will be proper to prepare the Marroons; and first, each Marroon must be primed with quickmatch in the following manner, take a 3 Ounce block with Nipples and place the end of a Marroon on the point of the iron Nipple, in the middle of the end of the Marroon, holding

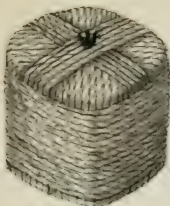
48.

Holding the Marroon with the left hand; with the right hand and Mallet give 3 or 4 smart strokes on the Marroon to drive it down on the Spindle into the powder; leaving the Marroon on; take  $\frac{1}{4}$  thread Quickmatch, cut off a short piece and point it at one end; then take off the Marroon, and put the piece of Quickmatch into the hole as far as it will go, make room with a round pointed prickler and put in a second piece, likewise a third piece, close the threads to the Quickmatch on each side with the prickler; then cut off the ends of quickmatch at about  $\frac{1}{4}$  of an inch above the top of the Marroon; place the Marroon so primed in a flat tray.

All the Marroons to be primed with Quickmatch in the same manner.

The following Sketches it is hoped  
will

will sufficiently explain the Method.



Marroon primed  
with Quickmatch.



Block with  
iron Nipple.

After all the Marroons are primed with quickmatch, it is usual to mix up meal powder with a little gum water to prime them a little at top round about the quickmatch, then they may stand two or three days to dry.

Next they must be rolled up in paper, the paper for this use is the whitey brown sort, which must be cut out in slips according to the size of the Marroon, and should be long enough to go about three times round the Marroon, and  
broad.

59.

Good enough to allow for Choking at both ends.

For Choking, there must be a line fixed to a staple or hole in the work table or to an upright post, 1 Binder line will be strong enough, having an old wood Cutter fixed to the end to pull by.

Every thing in readinces; take a Maroon and Roll it up in a paper, then hold the Maroon and paper tight in the left hand, and apply the line round the paper at the bottom of the Maroon (not at the pointed end) choking the paper tight all round, and securing the choke with 3 or 4 turns of fine packthread or 5 or 6 turns or hitches of coarse twine; then with the scissors cut off the superfluous paper  $\frac{1}{4}$  of an inch below the tie, and beat the bottom a little flat with a Mallet.

All

All the Marroons to be prepared or cased in the same manner; and then put in Store in Chests or Barrels with Covers.



*Marroon prepared.*

The next Article is the Lichas; which may be made either of indent or Cartridge paper, it is not necessary to cut whole sheets, if there are any waste pieces or slips — the former may be of Brass wire or beech wood about  $\frac{2}{3}$  of an inch in diameter and six inches long — the paper  $2\frac{1}{2}$  inches broad, and the length if indent paper, to form 6 turns round the former; if Cartridge paper 4 turns will be sufficient.

*The*

52.

The method of Rolling these small tubes is the same as for Portfire Cases; two or three dozen of papers being laid down on boards, must be pasted all over at top and then lay a few minutes to soak, then they may be rolled up, always pasting the former over for each case; when rolled, they may be laid in trays, to dry for three or four days.

I will be proper to Roll a quantity of these tubes, suppose 2 thousand, which will be a Stock for four or five years.

Sketch of the Turner for the tubes.

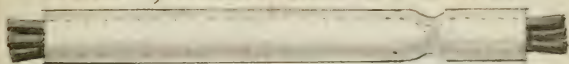
Full Sketch of the Tube.

$2\frac{1}{2}$  Inches.

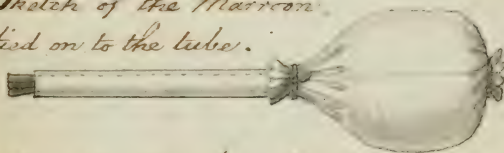
Next, the tubes must be quickmatched, using Match of four threads put through double, and with a round pointed prick make room, and fill each end with short pieces.

The tubes being Quickmatched, must be choked at about half an inch from one end, with a short choking line as usual, this Choking serves both to secure the Quickmatch, and to keep the Maroon tight when tied on to the tube.

The Tube quickmatched and choked.



Sketch of the Maroon tied on to the tube.



According to this Sketch, it is only required to put the choked end of the tube on the top of the Maroon, then gathering the paper close round the tube, tie it firm on with 3 turns of packthread; then cut off the superfluous paper all round at about  $\frac{1}{4}$  of an inch above the tie.

The

The tubes and Marroons thus tied together are ready for Fixing on the Nails.

To prepare the Nail; take cotton Quickmatch of 4 threads, and lay lengths of it all along the middle groove, from about 4 inches at one end to within 4 inches of the other end, observing to tie the ends of quickmatch with fine twine, as follows.

Lengths of Quickmatch tied together.

putting the twine only singly round at each place and tying it with a knot, fast lightly, so as not to cut or bruise the match. Then at each extreme end of the quickmatch put a middling tack nail, placing the point of the tack <sup>on</sup> one side of the Quickmatch, and about  $\frac{1}{2}$  an <sup>inch</sup> <sup>in</sup>wards from the end of the match, driving down the tack with a small  
brass

brass hammer, so that one side of the head of the Nail may catch the Quickmatch to keep it steady at each end.

then take two single Cartouches prepared, these Cartouches have been fully explained in Vol. 1: yet it may be proper to give a Sketch of them here,



Cartouch Top.

Cartouch bottom part.

the Quickmatch at the under part of the Cartouch 2, must be placed on near the end of the Quickmatch in the middle groove of the Rail so as to touch, the Cartouch must be secured with two licks, one done near the end at a, and the other through the lid or choke, using a sharp pointed pricker and a brass hammer.

Then having the Staples ready made of iron wire, about  $\frac{1}{2}$  of an inch thick and 1 inch long; bore holes with anawl or sharp pointed

56.

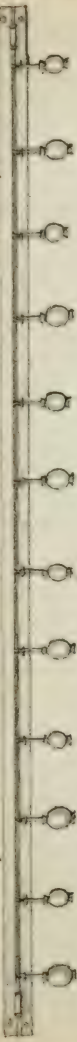
pointed prickler on each side of the short grooves, between the middle groove and bottom of the Rail, then half set in each Staple with a large brass hammer.

Next, take a 1 ounce Marroon with its tube, put the tube into the groove under the first Staple, so that the quickmatch at top of the tube may rest upon the match in the middle long groove, then set the Staple home & light as to pinch a little upon the tube at top, put on six a 2 ounce Marroon next, then a 1 ounce Marroon, and so alternately till the Rail is completed: this for the first Rail.

The second Rail has only one Cartridge, as may be observed in the Sketch of the Battery complete; the Method of fixing the Marroons is the same, only it is usual to put a 4 ounce Marroon at last for a Finish.

The

1<sup>st</sup> Rail Compealed with 9 Martoons by a Cartouch at each end, left unpasted, to show.



Battery of 9 Martoons completely Just for Throwing; by pulling off the Cap at the end of the short leader at A, to give fire at; the short leader on the middle gives communication



The Rails thus far completed, must be covered over all along the middle groove and all over the tubes, with pasted double whitory brown paper, laid on three times double all over the front of the Rail, and a piece put at the sides of each tube at the Bottom of the Rail, to secure from outward accidents.

The Rails being completely pasted, should stand for a week to dry, being sometimes exposed to the open air, then they may be varnished.

Lastly, the short leaders for Communicating the two middle Cartouches from Rail to Rail, must be prepared with quickmatch in the usual manner, and likewise the short leaders for giving fire by, these last must have a cap of varnished tube paper at one end, then they must be packed up together in paper and wrote upon what they are for.

The

The Pickets or uprights for fixing the Rails to, may be about  $4\frac{1}{2}$  ft long, 4 inches broad and 2 inches thick, sharpened at one end to drive into the ground; if they are to be fixed in any particular green plat or pasture, they should have put to them with trowels and levers, to avoid making holes.

This is the newest Method of forming these Batteries; which appears to me rather too quick, as it is in the Nature of a Running fire; however this Method was adopted as they do not miss fire, which was often the case in the old way.

Again; the distance of a whole minute between each Report, as used for Signals, would be too tedious for Fireworks; I think that  $\frac{1}{4}$  of a minute between each would be good time, and may be accomplished by fixing a short length of small case drawn with matchfire or other Composition in the middle groove between the division for each

60.

each Marroon; but it will be necessary to try first by the watch, to get the exact length for the proposed time.

It may perhaps be agreeable to touch a little upon the old Method; which was performed by Leaders quick matched and folded in various manners, viz!



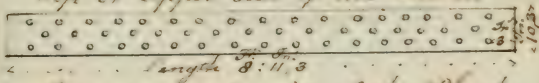
These Sketches it is hoped will sufficiently explain the Old Method.

Some Rails had holes bored along the middle, to which the folded part of the Leaders were attached by three turns of packthread; others again were fastened with nails; but being so subject to miscarriage this Method has been long exploded.

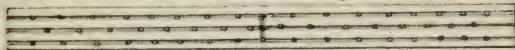
# POTS DE BRINS.

First it will be proper to describe the Planks, which are made of Beech Wood in the following form and dimensions.

Top or upper side of the Plank.



Bottom or under side of the Plank.



The Planks are 2 inches thick, and contain each 4 dozen Pots or 48 holes, each hole being  $\frac{3}{8}$  of an inch in diameter quite thro' the Plank; the back part of the plank has three grooves all along answerable to the holes and  $\frac{1}{4}$  of an inch deep, in the middle is a short groove across for communicating the grooves, as may be seen in the sketch.

These Planks have been made ever since the Grand Fireworks in the Green Park the 17<sup>th</sup> of April 1749: they have doubled the

the number of holes here specified, which we considered as an extravagance, and had every other hole plugged up.

To communicate the Planks, two being laid the grooved sides uppermost, in Brussels, take good Quickmatch of four threads, cut two lengths each equal to the length of the short groove in the middle of each Plank, and lay them in the groove, next begin with one of the long grooves laying lengths of Quickmatch all along and tying them gently together with fine twine in the same manner as explained for the Maroon Rails, page 54 — laying all the grooves with quickmatch and letting the ends come about  $1\frac{1}{2}$  or 2 inches beyond each extreme hole, then drive in a tack at each end of the Quickmatch in all the grooves, using a Brass hammer.

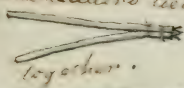
In the next place, the Communicating Leaders must be prepared. These

These Leaders were forgot to be inserted under the Article Leaders) but the Method of Rolling them is the same as for the others, the only difference being that these are made of whitey brown paper and varnished ready for use.

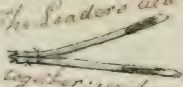
Cut four pieces of Leader, each about six inches long, at one end of each cut a slope about  $1\frac{1}{2}$  or 2 inches long then Quickmatch your Leaders double, putting in pieces at the square ends with the pricker as usual.

Then tie two together at the square ends in two places with coarse twine, the following Sketches will save a multiplicity of words. Fig<sup>1</sup>

The Leaders tied together.



The Leaders tied together under side.



The Leaders cartouched.



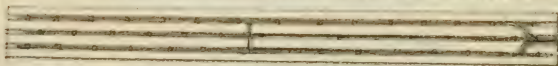
The first sketch, shows the upper part of the Leaders tied together: the second sketch, shows the under part of the Leaders

64.

Leaders with the quickmatch laying in the notched part; Sketch the 3<sup>d</sup> shews the leaders properly completed with a Cartouch.

Each Plank must have one of these Leaders first at one end; viz<sup>t</sup> place the quickmatch in the notches of the Leaders downwards upon the ends of the quickmatch in each extreme groove of the plank, so that the end of the Cartouch may be just even with the end of the plank; securing the ends of the leaders with nails and one thro' the Cartouch where it is tied onto the leaders, first making a hole with a sharp pointed, picket.

The Plank Quickmatched with its Cartouch.

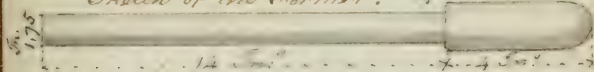


The Planks thus far prepared, must be passed all over the grooves and all over the Leaders

Leaders, and part of the Carlsachs, with double whitey brown paper pasted and laid on three coats one over the other; then set to dry for a week, after which they may be varnished.

We next proceed to describe the Pots, which are made of Cartoon paper pasted and Rolled on a wood Former: the Former is turned out of seasoned Beech or Ash wood.

Sketch of the Former.



Sketch of the Case Rolled.



12 1/2 In.

Each Case takes one Sheet of Cartoon paper doubled equally lengthways and cut in halves.

The Method of Rolling is the same as for all Pasted Cartoon Cases; the Case about

66.

about 3 dozen Slips on one side and hang them on stickthread lines to soak about 7 or 8 minutes; then begin to Roll taking down the two first pasted Slips, lay one Slip even with the edge of the Rolling table lengthways, then paste all over the former and laying it upon the slip, bring up the end of the slip over the former, pressing it close all along, and give the former a turn so as to secure the first edge of the Slip underneath the former, then continue to Roll up tight, to within about 3 inches of the other end of the slip, then hold the left hand on the paper and former to prevent its uncolling, and with the right hand take the second slip, and place one end about  
three

three inches over upon the edge of the first slip; laying the second slip straight so as to Roll up even at the ends with the first; then proceed to Roll up tight to the end of the second slip.

Next the Case must be examined, to see that it is tight and the paper at the ends even; if the ends are not even, the second slip must be unrolled, and put to rights.

Then give the Case five or six turns under the Rolling-board to draw the paper tight, and lastly add a little fresh paste all along the outward edge of the last slip, rubbing the edge with the thumb nail to set it close.

Take the Case off the Turners and add a little fresh paste at both ends, pressing the paper close all round between the finger  
and

and thumb of the right hand, then lay the case in a tray or on a spare table.

Each case to be Rolled exactly in the same manner; always observing to Roll up the first pasted *Stitch* in *Corner*.

This work should be performed as quick as may be, allowing about 6 or 8 minutes at most to each case, taking care not to Roll them too much with the Boards, for that would spoil the paper.

The Cases to Remain in the Rooms, do not to touch one another, for one or two days to harden a little; then they must be set in the Air, not in the Sun shine; and carefully turned and watched till they are about three parts dry.

All this period they are in order for Chalking, which must be particularly attended to, for if they are suffered to get any *moisture*, it will be difficult if not impracticable to

to choke them, the lines being larger, and therefore it will be better if they are not quite three parts dry.

For Choking, the Engine must be rigged with Hambro Line. And there must be a Letter exactly like the former, but a little less in diameter. A wood gauge to give the length for the Choke. And a wood Tiptoe to form the Centre. A 13 Inch Mallet, and 2 Pounder line to secure the Chokes with.



To Choke, first the Letter must be put into the Case to within  $\frac{1}{2}$  of the end of the Case; then take the Case with the Letter in) to the choking-Engine; put the choking line round the Case, and lay with the Gauge to set the choking-line to the proper length from the end of the Case.

Case; then put in the wood Nipple,  
 and holding the end of the nipple in  
 the right hand and the case in the left,  
 press upon the handle, moving or turning  
 the case gradually up and down the line,  
 sometimes easing off the line and pulling  
 it on a fresh; continuing till the case is  
 choked close to the Nipple all round; ease  
 off the Line and as quick as possible  
 proceed to tie down the Choke in the  
 usual manner with hitches, drawing  
 each hitch tight with an old wood cutter,  
 giving 7 or 8 hitches of the line, the first  
 being a double hitch, then cut off the  
 ends of Line even with the outside of  
 the Case; then placing the choked end of  
 the Case on a large wood block and give  
 three or four strokes with a 13 Inch Mallet

on the head of the Letter to set down the  
Choke a little—then take out the Letter,  
and proceed to choke the rest of the Cases  
in the same manner, with all expedition  
lest they grow too hard.

There ought not to be above two dozen  
of these Cases in order for Choking at  
one time, two dozen being a smart day's  
work for an experienced hand.

The Case complete.

Total Length of Case  
Exterior diameter  
Interior diameter  
Diameter of Vent



in.  
choked . . . . 10,5.  
of Cases . . . . 2,55.  
or Bore . . . . 1,75.  
hole . . . . 0,42

As the Cases are choked, they must be laid in trays and exposed to the Air to dry thoroughly.

And when thoroughly hard, the ends must be cut or pared even, taking off as little as possible.

It will require about 300 of these Cases or Pts for Shot in the large way.

The reason of leaving so much length below the Choke, is to make them last; for every time they have been fired and taken off the Planks, the edge must be rasped all round, just to take off the glow, (the Cases being set on the planks with glow) which rasping will in time shorten that part; however they will last 8 or 10 years with care.

The Cases being all completed, It will be proper to describe the Method of Loading

Loading them—and first, it is necessary to have a great number of paper tubes in readiness, viz: a Barrel or two full; these tubes must be prepared with double quickmatch put through, in the same manner as described for the tubes of the Maroon Batteries; the length and proportion of these tubes are follow,   
 Tube for Peto de Brins.



Total Length of Tube <sup>3<sup>in</sup></sup> 3, 1.

The diameter of these about <sup>3<sup>in</sup></sup> 3, 4. these are not rolled on purpose, but are only Cartridge paper Leaders cut into lengths of 3 <sup>1</sup>/<sub>2</sub> inches each, the Choking at one end shortens it to <sup>3<sup>in</sup></sup> 3, 1.

Next, is required to have a number of squares of tube paper cut out; each square being 4 <sup>1</sup>/<sub>2</sub> inches at each side.

Then let 3 Pound of corned Powder

and

74.

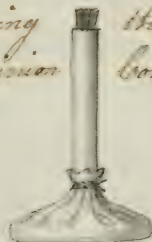
and 3 Pound of meal'd powder be mixt  
together, not bruising the Corn powder;  
let this be weigh'd out into half Ounces,  
or which is more expeditious, get a Lin  
Measure that will exactly hold half an  
ounce of the mixture.

Put half an Ounce of the mixture on  
the middle of each square of tube paper,  
then bending the match a little on one  
side at the choke end of the tube, put  
that end in the middle of the powder  
on the square, gather the ends of paper  
close to the tube all round, and tie them  
into the choke of the tube with two or  
three turns of coarse twine, then cut off  
the ends of twine, and the ends of paper  
above the tie all round, not quite close.

It will require 5 or 6 hands to make  
the Champignons; viz. One, to cut out the  
squares; A second, to weigh or measure  
act

out the Mixture of Corn and meal powder,  
and 3 or 4 hands, to tie in and compact  
the Champions, of which there ought  
to be two on three Barrels full ready  
prepared.

Sketch showing the form of the  
Champion Compact.



In order to determine the size the paper  
should be gathered to; it is usual to place  
each square equally on the end of the Bar  
or Pot former, pressing down the ends  
of paper all round with both hands, <sup>which</sup> this  
gives the impression of the proper circle,  
the sides of the paper standing up; this  
must be done before the powder is put  
in.

We shall now proceed to Load the Pot,  
first a Champion must be put in  
the

76.

the tube foremost, using the latter to  
push it down to the Bottom of the Case  
and taking care that the tube comes  
through the Vent hole of the Choke; let  
a Championian be put in like manner  
into each pot; preparing 3 or 4 dozen  
pots at one time.

Then the tops of each Championian in  
the pots, must be pricked with a few  
holes to open a Communication with the  
Powder; this may be effected three ways,  
first, by pricking them before they are  
put into the Pots; secondly, by means  
of a pointed wire long enough to reach  
them in the Pots; and thirdly, with an  
Instrument made exactly like the latter,  
only the bottom stuck full of sharp steel  
points.

Next put a  $\frac{1}{2}$  Pou.<sup>3</sup> Refined Lard full  
of common fire into each pot upon the  
Championian

Chamminion.

Then having ready a quantity of the Laboratory Rolled or Mould Stape, put about 16 of them into each pot, and upon them put a small handful of waste cuttings of tube or other soft paper and set it down a little with the former or latter, by hands to keep all tight; lastly cut out squares of whitney brown paper, large enough to cover over the top of each pot, and to reach about an inch over the side all round.

Use the small brush to paste round the top and about an inch and half down from the top all round, then clap on a square of whitney brown paper over the top, pressing the ends down to the base all round, adding a little fresh paste with the brush to make the joints lay close.

Place

78.

Place the Pots so capsed, in trays to dry for a day or two; when any parcell are dry, they must be marked at top upon the Paper with pen and ink in the following manner,



All the Pots Loaded with Stars must be marked at top in the same manner, to distinguish them.

Half the Number of Pots must be loaded with Stars and the other half with  $\frac{1}{2}$  Ounce Rain.

To Load the Pots with Rain, take a case or pot having its Champion and common firing; lay it lengthways carefully on the table, take  $\frac{1}{2}$  Ounce Squibs or Rain, and lay them in the mouth of the Pot as many as the Circle of the Bore will contain, observing to put all the

the pointed ends inwards, letting the  
Bowed ends be just even with the  
top of the base, having completed the  
Circle full, take the letter and push them  
home to the Champion's, then for those  
with stars) put in a row of soft waste  
paper, covering them with a square of  
whitely brown paper pasted on as before.

If any of the spikes or Nails should  
slip down, before the circle is filled, you  
must take all out again and begin afresh.  
Care must be taken, in loading the Pole,  
not to bruise the quickmatch at the end  
of the tube.

These need not be marked at top.  
When the Cases are all dry at top, they  
may be varnished all over the whitely  
brown paper case; and when dry, put  
in there till wanted to be put on the  
planks.

To Fix the Pole. Have ready a large, ho-  
lled

full of hot glw; take a loaded Pot and with a small brush, glw all round the bottom edge of the Pot, and putting the tube into the first hole set on the pot as quick as you can; (but the Planks should be laid upon two trossels for convenience of working) continuing in like manner to glw and set on the Pots, observing to place a pot loaded with Rains first, then a Pot loaded with Stars; again one with Rains, and so on alternately till the Plank is completed.

N.B. the Planks may be laid on two trossels at a time, and when completed with Pots, they must be carried and laid upon the floor of some spare Room, for a day or two till the glw gets hard and the Pots firm; then they may be set up leaning against the wall to make Room.

It is more convenient to fix on the  
 Bts in the spare Room, and when laying  
 them on the floor, put a small bottle under  
 that end of the Plank where the Cartouch  
 is, to prevent pressure, the Planks being  
 heavy.

It will be necessary, before any  
 Planks are put, to make a Calculation  
 of how many will be wanted for the  
 current Service of the Year.

Sketch of the Bot de Brins Complet

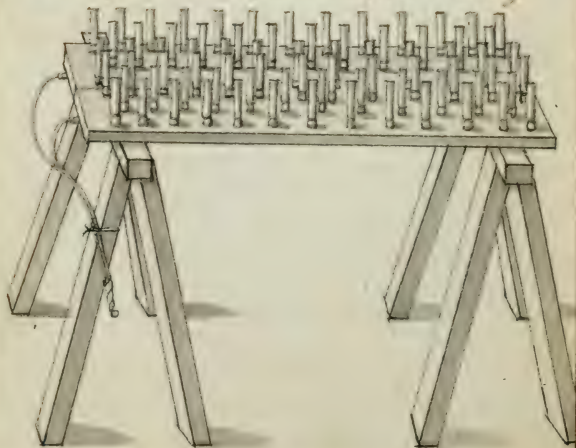


before they are glued on the Planks.

These Planks are usually placed on  
 Trussels of feet high, to prevent the Hob  
 from reaching or pulling them off: two  
 Planks being usually laid close to each  
 other on two trussels, minding to place  
 the Cartouches at the end of the planks  
 both one way; Open the Cartouches first  
 then take two Communications, each  
 consisting

consisting of two Leaders in length ready quickmatched; put the end of one leader into a Carouch and tie it in, the other leader to be put and tied in the Carouch of the other Plank; bend both Leaders gently down together and tie them to one leg of the tressel; bring both the ends of the leaders exactly together, and tie them in two places near the ends; then Case them with a slip of varnished paper.

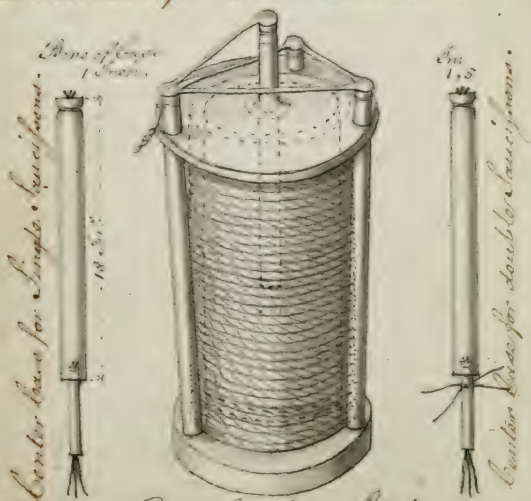
Sketch of the Planks flat ready for Tiring.



# POTS DES SAUCISSONS.

These Pots run large; they are made of pasted Carboen paper nailed on to a flat wood Bottom, and afterwards lined with glen.

I shall here beg leave to refer the Method of ordering these Pots, which will be fully explained under the method of making the Mortars for Air Balloons.



Pot de Saucissons ancienne  
Complet with base.

This

This was the ancient Method, which I thought might be satisfactory to insert.

The Pots are very large, being 11 Inches exterior diameter, and nine inches Bore; the Bottom Block is of Elm 4 or 5 Inches thick with a shoulder or Neck of 2 inches deep to glue and nail the bottom of the Case on to; the foot of the bottom Block, projects 2 inches clear all round from the exterior of the Pot, having three holes at equal distances, each hole being <sup>1 In.</sup> 1,6 diameter and 1 inch deep to receive the ends of the Cases with glue.

At the top of the Pot and even with the top, is an Elm Circle one inch thick and 4 inches projection, set on with glue; in this upper Circle are likewise three holes at equal distances to correspond with those below; but the 3 upper holes project about an inch farther out than the lower ones, which gives an oblique position to the Cases, by which means their fire becomes more expanded.

The

The Champignons differ from these for the P<sup>ts</sup> de Brins in having no tube, but are quite flat; a whole sheet of tube paper is necessary for one of these Champignons which must be put over the end of the Pot Former and pressed down all round in order to obtain the side of the Bore, as directed for P<sup>ts</sup> de Brins.

Corn and Malted Powder in equal proportions mixed together, is likewise employed for these Champignons; the Quantity for each single Champignon is 4 Ounces; and for double Champignons 8 Ounces; when the powder is put into the papers it only remains to gather up the ends close in the middle, tying them with three or four turns of coarse twine, then cut off the ends of twine and the ends of paper.

Champignon.



Front.

Champignon.



Back.

These

These Stitches must be properly understood; Next the Back Stitch will be the top while they are making; but when put into the Pots; the Back Stitch will be the under part.

To put the Champignons into the Pots.

Take two lengths of coarse twine, with which suspend the Champignon at right angles, then lower it down to the Bottom of the Pot, and draw out the twine.

Next take a sharp pointed Pricker and pierce the top of the Champignon in each Pot, full of holes; then put in an ounce and half or two ounces of common pins on the top of each Champignon.

Then take 2 ounces quibs; Pardons; or Quarter pound Rockets boined and primed; put in as many of one sort, as the whole circumference of the Bore will contain in one tier, observing that they are to stand upright, with the chokes or primed ends resting

resting on the Chamfron; then cut out  
Circles of Carleon paper one for each Pot,  
each Circle equal to the exterior diameter  
of a Pot at top, to serve for Covers;

Around the middle of each Circle, must  
be described a small Circle equal in diam-  
eter to the exterior diameter of the middle  
Case, which must be notched in the fol-  
lowing manner,

Circle of Carleon Paper.



thus far prepared, and supposing the  
Case to be all ready for Fixing—first, with  
a pair of Pliers or pinners draw out the  
middle Case from one of the Pots, to make  
room for the tube at the end of the middle  
Case to go down; take a Center line and put  
the tube down upon the Chamfron in the  
middle of the line; then take a Circle of Carleon  
paper as above; and force it over the head of  
the Case, down to the top of the Pot, this will

case.

raise the notches up round the case, which must be secured with three or four turns of coarse trim; Each Pot to be completed with a border case and cartoon cover in the same manner.

Then take strips of double tube paper, pasted, and cover all round the edge of the Cartoon circle and a little over upon the wood circle, keeping the middle Case as upright as may be; paste or cover all over the top of the Cartoon with broader tube paper pasted, and particularly where the notches are secured with twine to the Case, must be carefully covered all over with pasted tube paper laid at least three times double, one coat upon another all round, to prevent any fire getting in there.

The pasting being dry, fix in the  
side

side Cases, first dipping the bottoms about an inch in hot glue; this when hard keeps them firm in the bottom holes; then proceed to communicate or lead the tops of the Cases in the same manner as in the Skotch; after which they may be covered all over the tops of the Cases down a little below the Chamber all round and a little over over the leader next to the Cases or all over the Leaders, with double pasted, tube paper, and when dry they may be varnished; observing to put a small slip or Cape of tube paper twisted over the end of the short Leader to give Fire by.

Now for the Method of Preparing and driving the Cases, (which if mentioned sooner would have interrupted the Instructions for Fixing the Holes) first all the Vents must be stoped with a button of brown paper beat in a little with the Mallet

Mallet; then there must be a ladlefull of Clay drove down with 21 strokes of the Mallet and the long drift; next a ladlefull of common fire with 21 strokes of the mallet, again a ladlefull of common fire with 21 strokes, thus will the Case be prepared; each Case must be prepared in like manner, with one ladlefull of clay and two ladlefull of common fire.

These Cases must be prepared and drove in notched brackets, as has been before explained for Turbillion's, only proportioning the Brackets to the Cases.

And there must be four drifts of ash or Birch of different lengths, viz<sup>t</sup>. the longest equal to the whole length of the Case, 20 inches; the second 15 inches; the third 10 inches; and the last or short drift 6 inches; these lengths are exclusive of the handles, which may be about 4 inches, and

21  
each drift must have a brass ferule at  
the end, and the drifts should go rather  
easy than tight into the cases.

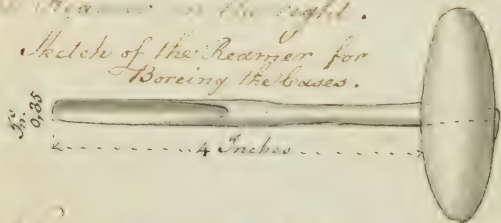
The Ladle, is that used for half pound  
Shot & Rockets.

These cases are usually drove with  
Brilliant Composition, <sup>1</sup>/<sub>2</sub> lb. that is for  
2 ounce cases for Trogonis and Vertical Wheels  
in Vol: 1: <sup>st</sup> the Method is, one ladle full, at  
a time, of Brilliant Composition struck and  
21 strokes with the 15 inch Mallet to each  
ladle full of Composition, till the case is drove  
up to within an inch of the top; all the cases  
to be drove with Brilliant in like manner,  
observing that all the cases for the sides  
must have 2 ladles full of Clay drove at top  
of the Composition, each ladle full of Clay  
to have 21 strokes with the Mallet and short  
drift.

All the Center Cases to have no clay at  
the ends, on account of fixing in the spica  
matched tubes.

The Cases being all done, the next thing is to Bore them: And first, the brass paper plugs must be pickt out of all the Holes, then with the Reamer bore through the Clay at the Shot, just so far as to touch the common fire and to bring out a little of it which will be seen on the end of the Reamer, it will be necessary to take out the Reamer now and then to clear out the loose clay and to see how far you have Bored; in this Operation the Case must be held horizontally in the left hand, and the Reamer in the right.

Sketch of the Reamer for Boreing the Cases.



Now, supposing the diameter of the Bore of the Case to be 1. Inch, then  $\frac{3}{8}$  in. is a little more than  $\frac{1}{4}$  of the Bore; and so it ought to be; for in such long Cases

near the Vent to be only 1/2 it would  
 endanger the Bursting of some of the  
 Cases, especially Sendrover with Brilliants.

The Cases being Bored; the next Step  
 is to prime them with Quickmatch of four  
 threads; first take a sharp pointed pick  
 and scratch the top of the Cannon fire  
 a little in all the Vents, then use a round  
 pointed pick to set in the quickmatch  
 and when the Vent is full, cut off the  
 ends of Quickmatch even with the top  
 of the Case.

Then prepare the tubes or portfire  
 Cases with Quickmatch, choking it at  
 one end; there must be a wood cylinder  
 of 1 inch in length; and of such diameter  
 as to fit into the end of the brilliant Case  
 with a hole thro' the middle to receive  
 the top of the Portfire; first glue the  
 wood cylinder into the Case, then set  
 the top of the Portfire case into the  
 wood cylinder with glue, taking care that  
 the

94.

the glue does not run over the top of the  
quidmatch so as to prevent its catching  
fire from the Brilliant, then let the  
candle bases with their quidmatched  
tubes, rest a day and night to harden  
well.

The length of the Portfire Cases or tubes  
must be proportioned to what the Pot is  
loaded with. viz. whether it be  $\frac{1}{2}$  lb. or  
 $\frac{1}{4}$  lb. Rockets launched; 2 ounce Squibs, or  
2 ounce Sunders, the length of the tube  
must exceed the length of any of them by  
at least half an inch from the end of the  
brilliant base:-

The cases being all ready as above,  
proceed to fix as directed, beginning at  
Page 84.

To Fix the Pots double.

Here the Quantity of Powder for the  
Champion is 8 ounces; Common fire  
2 ounces.

The lower tier being 1, 3<sup>rd</sup>  $\frac{1}{2}$  lb. Rockets  
launched.

bounced, take out the middle one and fix the outer case with its tube double quickmatched, as at Page 83, spread the four ends of Quickmatch upon the tops of the Rockets; then upon the Rockets put in a tier of 2 ounces Squibs or Lardons; for all the rest proceed exactly as with the Single Pots.

Here the length of the Quickmatch tube or Potfire case must be sufficient longer than the whole height of the two tiers of Rockets and Squibs.

The 1<sup>st</sup> Pounder Rockets are at present made short on purpose for these Pots; their whole length when completed is 6 $\frac{1}{2}$  inches; drove 3 diameters from the choke, and bored 1 $\frac{1}{2}$  diameter, then Bounced.

The Lardons are likewise 6 $\frac{1}{2}$  inches long, drove <sup>In.</sup> 3 from the choke with common fire; bored 1 inch with a flat Bit in the Centre, then Bounced, their whole length when completed is 6 $\frac{1}{2}$ .

The Rockets, Lardons and Squibs

must

must be primed at the Vents, as directed  
 for the Round Rockets for Flight; with a  
 bit of quickmatch and a small lump of  
 melted powder mixed up with gum water.

These Pots usually stood and were  
 fired upon the Ground.

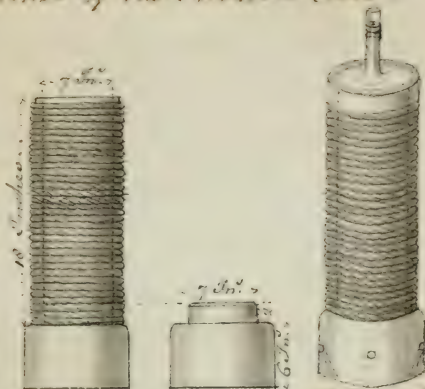
So much for the Antient Method,  
 which may be sometimes employed for  
 Curiosity's sake.

The Modern Method differs, in  
 that such large long Cases are not used;  
 the Pots are not near so large; not hav-  
 ing wood circles, nor Cases on the out-  
 side; and are both fully sufficient and  
 less expensive.

The Pots now used, are made from  
 the Mortars for Air Balloons, which will  
 sometimes give way near the bottom. Now  
 the bad part is then cut off all round,  
 to be glued and nailed on fresh Bottoms,  
 for Pots de Salvations, which is a saving.

# Sketches of the Modern Pot.

27



Pot empty. Block 10 In. Pot 3/4 full.

There are no boxes on the outside, but only a single case in the middle; Now let us observe what is necessary to be done, in fixing these Pots, viz.

The Champion contains 4 ounces of corn and meal Powder.

Common Time for each Pot  $1\frac{1}{2}$  ounces.

Garniture, to consist of two ounce Larders or squibs in one tier, these Pots being never loaded double.

Circles of Canvas paper; there must be

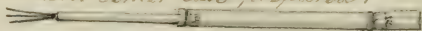
one to cover the top of each Pot; these circles are formed with a pair of Cutting Compasses.

The Center Case or Gerb; as these Pots generally accompany other works; it is necessary that the Center Cases be of the same Nature as those for the Accompaniment; and to be drove with the same Composition; whether Brilliant or Chinese.

The Cases, when drove, must be Bore and Quickmatched in the usual manner; but as the Cases now used seldom exceed 10 inches or a foot in length; the Vents must be exactly  $\frac{1}{2}$  of the Bore of the Case.

Each Center Case for the Pots must have a Cartouch of Garnished tube fast at the Quickmatched end, and at bottom a quick-matched length of Parting Case shoves into the bottom of the other Case.

Modern Center Case prepared.



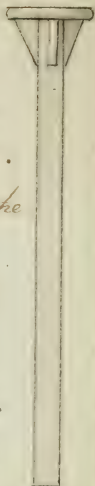
Then

Then the Neck is the same as before, viz. take out the middle Larden and fix in the Center case, put on the Circle of leather paper lying the matches round the Case. the method of pasting the top is the same as for the Antient Pots, and must be made secure especially where the matches of the Circle are tied round the Case; lastly take strips or Bands of pasted double table paper about 2 1/2 inches broad, and paste all round the outer edge of the top of the Pot, laying part of the breadth upon the Circle all round, and bringing the rest down the side of the Pot; as may be seen in the Sketch of the Pot Complicat.

When dry, they must be varnished all over the pasted part.

For Fixing these Pots, there must be strong Posts about 7 feet high and 4 inches square at least, capped with strong elm circles secured with 4 brachets, or

in the following Sketch.



The elm Circle at top must be equal to the diameter of the Bottom of the Pot, and about  $1\frac{1}{2}$  inch thick.

When the Posts are to be set in the ground, there must be holes dug 14 or 16 inches deep, in which the Posts are to be set, and the earth rammed tight in to back them



firm and upright; then the Pots may be nailed on by

the help of Stape, and the Communications fixed.

If they are intended to accompany other Works that have a frame, the bottom of the Posts must be tenoned as in N<sup>o</sup>. 2, and being fixed in the mortices of the Frame, are secured with an iron Pin or Bolt.

The Communications, for these Pots may consist of two Leaders in length, which will be long enough: the quick-matched and

of the Communication must be tied into the Cartridge at top of the Case so as to touch the Quickmatch in the Vent of the Box; then the leader gently bent down and tied to the Post in two or three different places.

When these Pots stand single, it will require a person to stand to each to fire them; each person pulls off the small cap of paper at the bottom of the leader, and each person having a lighted Potstick in the hand, one gives the signal that they may all fire together.

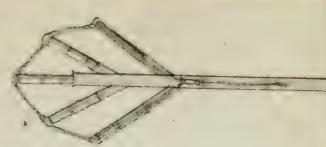
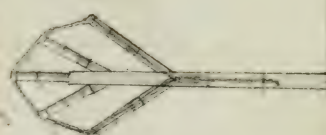
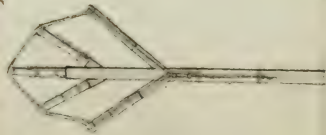
These Pots may be employed on any occasion required to represent the Eruptions of Mount Stromboli, Vesuvius, Etna, Hecla &c. and in this case they must be differently loaded; some with Lard and some with illuminated Marroons, light Balls and Stars.

They are likewise introduced to accompany each Pyrotechny; of which instances will be found in the Course of this Work.

The following Sketch is intended to serve as a Specimen.

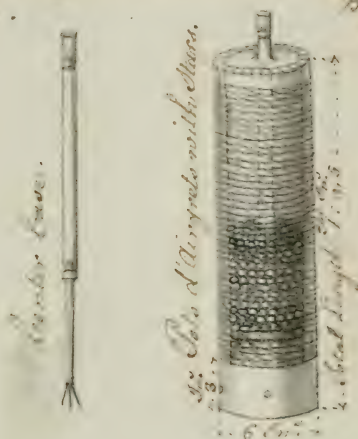
Sketch

SKETCH of 4 Ranges of Minerals and Ore to be displayed; there are only 20  
 20 Ranges and 20 Ore; but the Ranges may consist of 5 or 6 pieces of minerals;  
 and the boxes down with Knives; Composition; it will require an  
 Man to each piece, to give them all together.



# POTS DE AIRGRETS.

These Pots are considerably smaller than those for Saucissons, but made in the same manner.



These Pots are usually loaded either with half an ounce of Squibs or Stars; the quantity of Powder for the Champion is 2:8 of corn and meal powder mixed together. The Champion is to be made up in the same manner as described for Saucissons.

The Contents must be determined according

according to the intention; if, they are to accompany other Bicks, as in Buck Reverses; tops of Cascades; Eruptions or any other Devices: the bases must be the same for them as for the rest; and must be done with the same Composition. It should be observed that only two — Natures of bases have been used with this intention. Viz. Two bases and two designs, the Two bases being always done with Brilliant, and the two designs with Shining Composition.

When they stand single upon Poles in a Range or upon the Ground; either sort of base may be employed at pleasure.

There is a difference in loading with squibs or Stars; for Squibs, they must be put in, in one tier as described for single Crucifones, and to fix the center Case draw out one or two of the middle squibs with a pair of pincers.

For

For loading with Stars, set the Center Case with its quickmatched portfire Case in the middle of the Championions, then put in the Stars all round; about 2<sup>th</sup> weight of Stars in each Pot.

Particularly observing to prick the tops of the Championions in each Pot, and putting about an ounce of common fire over each Championion after they are pricked, before the igniter Stars are put into the Pots.

The rest is exactly the same as for the Pots de Sauvissone, viz: a Circle of Cartron paper to cover the top of the Pot, the Potches tied round the Case, and well packed; when dry to be varnished.

There are several Methods of entering the Communications to the Center Case as is seen in the Sketch Page 103, a Contrivance of varnished Lath figures is supposed to be tied on at top of the case round the Choke, which is sufficient for any leader, but there is another method often used according to the following sketch, which

saves the trouble of getting up so high to tie the Leaders into the top Cartouches.

Here the Quickmatched Leader has a Cartouch at one end, the other end being tied at top of the Case, then gently bent down into the top of the Pot and brought down at one side, where it must be secured with a couple of tacks, one about two inches below the top of the Pot, and the other at the top of the bottom Cartouch; then the Leader must be covered all over with pasted double tube paper according to the sketch, and when dry, finished.



In setting these Pots on their Posts, care must be taken to place all the leads and Cartouches in front.

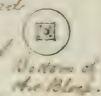
If they are to stand on the ground, the top of the Case need only be capped, which must be opened with the point of a knife or the thumb nail just before they

they are fired.

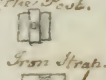
There is another method of securing these Pots, for fixing them on the tops of Posts, &c.

Here there is an iron plate with a male screw; the plate about 3 inches square and  $\frac{1}{2}$  of an inch thick, let in flush with the bottom of the Block and secured with 4 strong wood screws, one at each corner;

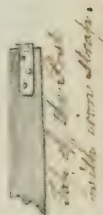
the screw is about  $5\frac{1}{2}$  diam; and 4 inch in length.



Top of the Post.



The top of the Post has a strap of iron about  $1\frac{1}{2}$  inch broad at top and  $3\frac{1}{2}$  thick with a female screw to receive the male screw, and secured to the sides of the top of the Post with wood screws, as in the sketch.



The turns of the screws should be contrived, that when the Pot is secured home, the Leader and Cartridge may be in front.

front.

It is hoped that the foregoing Hints are sufficient, and shall therefore beg leave to dismiss this article, only observing that these Pots may be used for many purposes where Pots as Sautignons would be too large; and besides the Pots d'Angrets are less expensive.

# AIR BALLOONS.

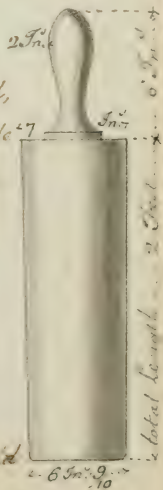
This will be an extensive description and according to Promise am to Explain the Method of Making the Mortare which is to serve as a General Rule for Making the Pots for Saucissons and Virgats.

1<sup>st</sup> It will be necessary to have a Former turned of Fir wood; as Beech Ash or Elm would be too heavy and expensive.

In this Sketch of the Former, it must be observed, that the Body must be made a little tapering from the top downwards which is here 10 of an inch.

If the Former was to be equal from end to end, it would not deliver, a turn signifying, that the Case would come off very difficultly or not at all.

For Rolling; the Whole Sheets of



Carboon paper must be well pasted all over on one side. Then being <sup>hung</sup> upon pasted lines to soak for 3 or 10 minutes, then the person that Rolls, takes the former and pastes all the body over with the brush, then takes the first pasted sheet of paper and lays it flat on the Rolling table, the pasted face of the sheet upwards.

Next he places the former on the paper and bringing up one edge, presses it close to the former all along and keeping the fingers at top, gives the former a quick turn to catch the first edge of paper underneath, then continues to Roll up within 3 inches of the end edge of the first sheet, the man that pastes hands him a second pasted sheet off the line, which the Roller places with the edge about 3 inches over the end of the first sheet, laying it by the eye as near  
as

as he can judge so as to Roll up even at  
 the ends with the first sheet, then continue  
 to Roll up as before, in like manner a  
 third sheet and then a fourth, keeping the  
 ends even; at this period the Rolling-board  
 may be used for five or six turns with  
 great care; then about 3 inches breadth  
 of the last sheet must be opened all along,  
 and the fifth sheet being laid straight all  
 along upon the opened edge the Rolling  
 is to be continued as before and so on for  
 the 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> Sheets, then using the  
 Rolling-board as before; next 3 inches of  
 the outward edge of the 8<sup>th</sup> sheet being opened  
 all along, place in the 9<sup>th</sup> sheet continuing  
 to Roll, then the 10<sup>th</sup>, 11<sup>th</sup> and 12<sup>th</sup> Sheets in  
 like manner, next 5 or 6 turns with the  
 Rolling-board to draw all tight.

Lastly add a little fresh Graft all along the  
 outward edge of the last sheet pressing and  
 rubbing it down close; then add a little graft  
 at the edges pressing the paper close all  
 round at the ends between the finger & thumb  
 Press

Place the Case so finished, (after the former is drawn out which requires two persons, one to hold the Case while the other draws out the former) upright on a table to harden for a Week.

I do not at present recollect whether each Case takes 12 or 13 sheets of Cartoon Paper, but there ought to be  $\frac{1}{2}$  an inch thick all of paper all round.

The principal points in Delling are to keep the paper close and as even as possible at each end; if any Bagging or looseness of the paper is perceived, so far must be corrected again and put to rights, observing that the less the paper is torn or with, the stronger the Case will be.

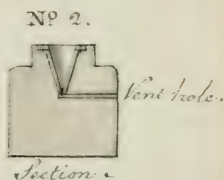
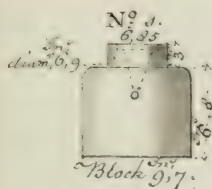
It is smart work for two people to complete 4 of these Cases in a day.

About 3 or 4 dozen of these Cases will be a good Stock — there are many others completed in some of the Store Rooms.

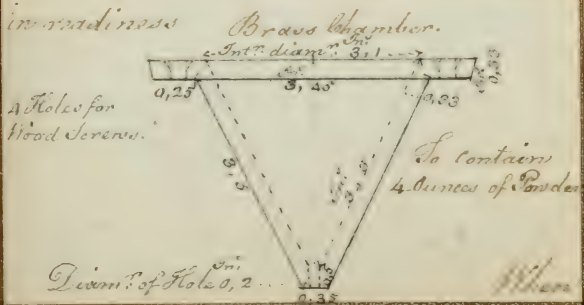
After

After the bases have stood about a week on the tables to harden; they may be set out in the shade in the day time for about a fortnight to dry thoroughly.

The next article is to get the bottom blocks turned for them, viz:



The blocks are turned of Elm wood well seasoned; and the hollow for the Brass Chamber should be formed while the block is in the lathe; on which account it will be proper to have the Brass Chamber in readiness.



When the Blocks are turned, the Chambers may be screwed in; and then the Blocks should stand for a week or two to settle for shrinking — indeed it would be better if the Blocks were to be turned a fourth time before wanted, leaving them a little larger than the last dimensions to allow for shrinkings as they might easily be put in the Lathes again to finish them.

It may be necessary to observe, that the taper or narrower end of the base ought to fix on this Block.

### To Fix the Cases on the Blocks.

first; fit a base on each Block according as they are found to answer best, leaving the base so fitted on its block.

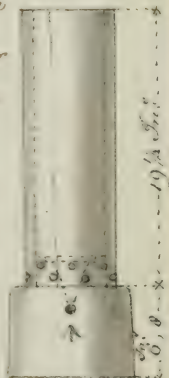
Then having a quantity of hot glass, take a block and pull of the same glass all round the neck of the Block and set on the Case again, laying a flat board at top of the Case and striking with a heavy Mallet to

to set the Case down home to the shoulder of the Block — each Case to be fixed on its Block in the same manner.

In the next they are to be nailed all round to the neck of the Block with strong flat nails  $\frac{1}{2}$  inch long, according to the following Sketch,

The lower tier of Nails are  $\frac{3}{4}$  of an inch above the shoulder of the Block and about 3 inches apart all rounds.

The upper tier of Nails are about  $\frac{1}{2}$  Inch above the lower tier and placed between the others, as in this Sketch; using a large broad awl to bore the holes, then a small gimblet, taking care not to split the Block's.



Sketch of the Block with the Case fixed and nailed on.

The next Article is to Hoist them with Cord; the Cord must be  $\frac{3}{4}$  inch diameter, and should be stretched in the usual manner, as

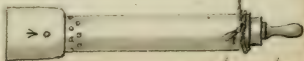
for moulding Cases, splitting & perfecting  
 &c.

Method of Moulding. First, all round  
 the exterior of the body of the former must  
 be well rubbed over with black lead, to  
 facilitate the getting out of the former after  
 the Cases are moulded.

One end of the Cord must be fastened to  
 some fixed body, the other end must be beat  
 flat for two or three inches to begin with.

When the former being put into one of  
 the Cases, One Man takes up the Mould  
 holding it horizontally resting upon his  
 thigh, the other attends with a pot of hot  
 glen and a small brush, this man lays  
 on glen about an inch broad all round at  
 the top of the Case, then places the first  
 turn of Cord near the top so as to catch the  
 flat end of the Cord, thus

In this Sketch the Cord is short  
 for want of Room, but  
 hope it is sufficiently



explains

explanatory.

When the first turn or litch is set, the Mortar is kept turning round as far as the glass allows, then a little more glass is laid on; and the moulding continued as the glass; proceeding in this manner, glazing a little way at a time and moulding to it all the way close down to the shoulder of the Block, leaving to lay the turns of cord as close to each other as possible, and to beat them down at intervals with a large Mallet to make it take the glass; when the case is moulded home to the shoulder of the Block, lay it upon a Bench or large Block and drive in a strong clout nail through the last end of the Cord to secure it, then cut off the end of cord about half an inch beyond the nail, beating the end down with a little fresh glass and the Mallet; then drive in another nail

about

about 2 inches back from the first.

The next Step is to get out the former which requires both hands, one to hold the molar while the other men gets out the former which is sometimes difficult and would be much more so, if the former was not rubbed over with black lead.

All the brass to be cooled with oil in the same manner.

In this work of Moulding it is necessary to give but a little way at a time on the molar turner both, because the glue soon sets, and the base with former and plate are heavy.

And here appears the reason, why the taper end of the base must first rest upon the bottom block, otherwise the former could not be got in for Moulding, which is absolutely necessary, to keep the base to its true roundness.

Then the Mortar completed, will be

— casting

according to the following Sketch;

Having completed the Mortars, they may be put in Store.

When the Mortars are well made they may last good about 30 years.

We shall now proceed to the Air Balloon Shells, which were formerly made circular of pasted paper, in the same manner as the paper Shells for Smoke Balls; but these were found to be too strong, so that the bursting of the Shell, by its violence destroyed the Effect of the Store.



Mortar  
Completed.

I shall say no more then about the old Shells, but proceed to the new method.

These Shells are usually turned out of Alder wood, and consist of two parts the upper part shuts over upon the bottom like a snuff-box, and they are  
not

not quite spherical but a little oblong  
as in these Sketches,

The Shells are made

nearly in this form; the  
thickness at the fire

hole is  $\frac{In}{6}$ , 65; at bottom

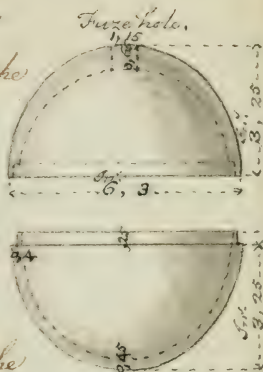
of the lower half  $\frac{In}{6}$ , 45;

tapering to  $\frac{In}{6}$ , 4,

leaves too thick for the

shoulder and  $\frac{In}{6}$ , 3 for the

neck or collar which shuts into the upper  
half.



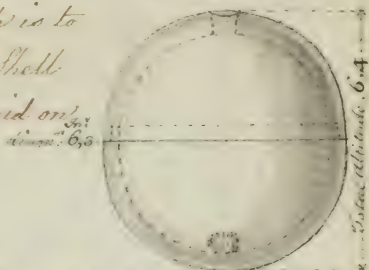
Having a number of these turned  
and fitted to each other; take  $\frac{In}{6}$ , and  
pulling off the top, put a ounce Maroon  
ready primed into the lower half, then glue  
all round the neck and shoulder, and set  
on the top quick: All the Shells to have  
a Maroon, to be glued and set together in  
the same manner; then to stand for a day

two, till the glue or joint is firm.

Then the Shell will be in the following form,

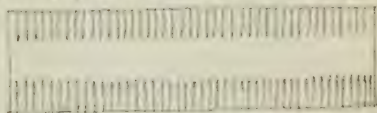
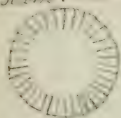
The Shell glued together.

The next Step is to cover over the Shell with Canvas laid on with glue.



Form of Canvas for the Top and Bottom.

Form of the Canvas for the Middle.



It will be proper first to cut out these patterns in paper, ordering the matches so as to fit close to the Shell; then the Canvas patterns may be cut out by them as many as are wanted.

1. The wood Shell must be set on a round flat wood bottom, then the middle of the Shell being glued all round, the

middle

middle piece of Canvas must be laid in all round and pressed close all over, then the top and bottom pieces are to be laid on with glue in the same manner.

Observing that the top and bottom pieces must be large enough to reach about half an inch over the edge of the middle piece at each end; letting the Shell so covered remain upon its wood bottom.

Each Shell must have a wood Bottom to stand on, and to be covered with Canvas laid on with glue in the same manner; joining them regular as they are done, and letting them stand a day or two to grow hard.

This Work is generally performed in the Lodge where there is a fire, both on account of heating the glue and drying the Shells.

When half a dozen Shells have been  
covered

covered over with canvas and dry, the next step is to cover each Shell over with a single coat of whitey brown paper, of which a sufficient number must be cut out in the same manner as the Canvas; this paper must be laid on with paste and pressed down every where; always beginning with the Shell first covered over with canvas, and so on in succession, letting the Shells covered with paper remain on the wood bottom to dry for a day.

Next morning let them be covered over with a second coat of whitey brown paper laid on with the paste, and let them stand a day to dry, then they may be set off the bottoms for a day longer.

Lastly with a small sharp knife cut out the Canvas and paper to open and clear the four holes, the Shells thus finished may be carried into Store.

It is best not to have too many in hand at once; and always when one

parrel

124.

parcel is finished let them be carried into Store.

About six Dozen Shells thus finished will be a good Stock.

One of these Shells from the Burners' hands, including wood and Labour, may cost about  $2\frac{1}{6}$ <sup>5/10</sup>; Canvas, glue, paper and paste, with a mans time to cover one may amount to about 8 pence.

These Shells being thus far completed, the furcs must be bound for them out of 10 Inch furcs for shells ready drawn and the dimensions must be exactly according to the following Sketch,

It will be necessary Furcs, full dimensions.

to have two or three

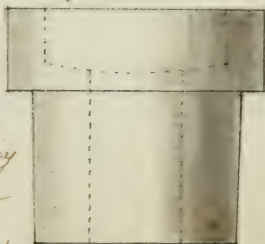
dozen of these Furcs

turned more than may

be wanted; on account

of picking to fit them

to the furc holes; One 10 Inch Furc will make  
about



about four of these.

## To Fill the Shells with Stars.

1<sup>st</sup>. Let about a dozen Shells be brought out of Store in a Basket, and having a number of Fuzes, fit one into the fuze hole of each Shell, letting the fuze sit rather a little tight than slack, leaving the fuze as fitted, in the Shell.

Then having a quantity of mould Stars middling and large, in a leather Bottom, take a Shell and pulling out the fuze, lay it upon the working Table and likewise the Shell, take up a handful of Stars and drop them into the Shell, then holding the Shell with both hands, and thump its bottom moderately upon the table to settle the Stars as close as they will lay, put in another handful of Stars and settle those by thumping as before, or continuing handful after handful, always thumping the Shell well between each handful.

'Till

Till the Shell is so full as not to admit a single Star more; then put in a tin funnel and pour in two ounces of corn powder, shaking or thumping it down into the Shell, next put one ounce of common fire into the funnel and shake it down. then take away the funnel and set the piece lightly in by hand, placing the filled shell apart; and proceeding to fill each shell exactly in the same manner.

When the 12 Shells are completed with Stars, corn powder and common fire as above, the next point is to glow in the fuses.

For this purpose it will be necessary to have a flatfield of hot glow; in melting glow in a common lead flat, I could wish the following caution to be always observed viz<sup>t</sup> to dip the bottom of the Pot into cold water to prevent accidents, before it is carried into the Room.

Then with a small brush or flat piece  
of

of stick, glue all round the neck and shoulder of the fuse not missing any part under the shoulder, and taking care that none runs, also upon the composition at bottom of the fuse; then set in the fuse and laying a flat piece of wood at top of the cup, strike with an 8 inch mallet moderately on the wood to set the fuse in close home to the shoulder; this work ought to be done quick and at the same time with great care.

Cask Shell to have its fuse glued and set in exactly in the same manner; taking particular care not to break or split the cups in setting the fuses home.

Let the shells with their fuses glued in, be put in a tray or basket, and set in another Room for a day or two, that the fuses may be firm.

Continuing in the same time, to fit fuses into another parcel of shells, to fill them with Star, with composition and common fire.

fire, glowing and sitting in the furnes as before; let this parrel be carried into the same Room as the first; and bring the first parrel back into the working Room.

**To Prime the Furnes of the first parrel.**

This is a critical point and ought to be done by one that understands it well.

1<sup>st</sup> Let the basket with the Bullion be placed at some distance from where you work; take out one covering the vat over with a sheet skin to prevent accidents; carry the Bullion to the working table, and with a flat pointed brass prickler shape the top of the Composition in the cup a little (this is to make it catch fire more surely) then,

put in a tunces ladlefull of dry mixed powder, like a short wood <sup>drift</sup> about  $\frac{3}{4}$  of an inch diameter and place it on the powder, and sit down the powder a little with 6 or 7 strokes of a  $5\frac{1}{2}$  inch Mallet.

Next

Next take Quickmatch of 4 threads, cut off a length and double it, coil it close till it fits the interior diameter of the Cup; cut off the side and put the coil of Quickmatch flat into the Cup; take a wood drift a little less in diameter than the interior of the Cup, place it on the Quickmatch and with 6 or 8 moderate strokes of the 6 lb. mallet, set down the Quickmatch.

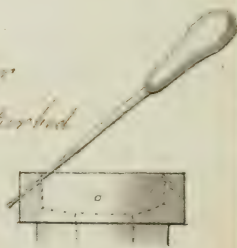
After the mealed powder with spirits of wine is to a pretty stiff consistence, take up some on the end of the middle finger and fill the cup pressing it close; then turn down the Cup quick on some dry mealed powder put on a sheet of brown paper, pressing the Balloon down hard with a burn or two to set the mealed powder in tight; take up the Balloon and clear off the loose powder round the outside of the cup with a feather or flannel duster, thus will the Fuse be primed.

To Secure the Priming. take small mass

wire about  $0,025$  diameter, that has been coated in the Sirex a long round, small pointed pricker, a little flat at the end, the a small round wheel, and a pair of small plates and wires.

Then with the long pricker or steel, bore 4 holes at right angles through the side of the Cup, beginning at the edge of the composition at top and coming through at about the middle breadth of the Cup on the outside, thus,

Bored in this manner the Priming is not disturbed by the Pricker; which is also the reason why the pricker must be long at least  $3\frac{1}{2}$  or 4 inches; if it were to be short, the fingers would catch the Priming and disturb it.



Then having bored the 4 holes, cut off a length of wire about 6 inches long, fast one end,

and thro' one of the holes at top, about an inch through, likewise the other end of the wire must be put through at top of the opposite hole and drawn very flat at top, the long end to be carried to the next hole and put thro' from the outside, and being pulled tight, carry it across, putting the end thro' the 4<sup>th</sup> hole at top, draw both ends tight, then with the plyers twist the two ends together close to the outside of the cup, 3 or 4 turns are sufficient, cut off the ends of wire leaving about 1/2 of the twist, and with the end of the plyers push the twisted ends close to the outside of the cup.

Lastly, take double squares of brown paper and lap the Fuzes lying on the paper or top with coarse twine, then slip off the ends of paper all round.

The Fuzes Primed  
and Wired.



The Fuzes Capped.



When

When the Fuses of one parcel are completely primed, wired and capped, let them be carried immediately into store, and put in five or six feet Shells with Bullets.

Continuing to fill with Bars and to glow in the fuses; and to prime, wire and cap the preceding parcels, till the whole are completed.

And here it is earnestly recommended that these directions for Priming the fuses be most strictly observed; For, to consider that one of these Shells contains nearly 4 pounds and projected by 4 ounces of powder, what fatal consequences may be expected from its <sup>v2.</sup> fall and <sup>sv</sup> velocity, among a numerous crowd of Spectators; should by any accident the fuse miss catching, and the Shell go up blind; which is the reason of giving so full a description of the Method.

Let

Let us now return to the Mortars; and first of necessary precautions to be observed for them.

In the first place, it must be considered how many will be wanted; then let them be chosen out, observing that the Chambers be firm and the serims not started; that the Blocks are sound and not split any where; and that the Cores are in good condition. It is easy to infer that these last precautions are unnecessary for New Mortars.

Let the Mortare as chosen be carried to the working-room; the Outside and inside must be cleaned from dust &c. with a hand-brush.

Then take one of the small-wires for Pulling Leaders on, and push it down thro' the hole or slit at bottom of the Chamber to clear it from dirt &c. that will sometimes get in so as to choke up the hole; clearing or clearing the hole of each Chamber by pushing

pushing the wire down, this done, & take empty Cartridge paper, and bring one of the Mortars near the door, setting the Tent hole in the Block next to the light, put the small end of the Leader down to the bottom of the Chamber inside, apply the mouth to the trumpet end of the Leader, and blow strong, at the same time carefully observing the Tent at the Block, to see the dust fly out, which will be a sign that the vents are clear. Apply the Leader to each Mortar in the same manner.

Then take the middling sort of Cartridge paper Leaders varnished over for all work. One for each Mortar, and cut them all to one length, viz: 18 or 20 inches, cutting off the trumpet ends.

Put a length of good thread quickmatch  
into

into each leader, observing the following  
 Method; Lay the Bundle of quickmatch  
 upon a sheet of brown paper, then  
 put the end of a single length of match  
 through a leader, cutting off the match as  
 long as wanted, vizt. about 2 inches longer  
 than the length of the leader; the reason  
 of this is to save all the short lengths rather  
 Bundle; as they are very serviceable in  
 priming the ends of Leaders, Quickmatching  
 of Cases, and other services, and saves the  
 cutting of whole Lengths for these purposes.

The Leader as first Quickmatched.

The Leader primed with Short Pieces.

The Leader primed and Capped Complete.

It is imagined no farther description is  
 necessary, only to observe, that the short pieces  
 are put in at the ends by first making room  
 with a round pointed stick or wood, and  
 that the Capping or pointing is part of a slip  
 of varnished lute paper twisted on.

When

When all the Leaders are prepared, as at the 2<sup>d</sup> Sketch foregoing, they must be applied to the Mortare according to the following Sketch,...

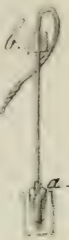
Here the open Quickmatched end of the Leader is to be put into the Vent-hole of the Block and shoved home; then the Leader gently bent up and a tack drove into the side of the leader about an inch above the vent hole to secure the leader there, carry the Leader straight up, and about a foot above the vent drive in another tack; then gently bend the leader round putting the capped end underneath, as in the Sketch.



Next they are to be packed, by laying packed double tube paper, twice thick, over the vent hole and leader up to the top of the Block, pressing the paper close; then

put a piece behind the leader hanging  
the ends down over the first piece, thus, a,

If not well secured at that place,  
either rust or fire might easily get  
in and spoil the Communication;  
the upper piece at b, is only double  
paper, pasted, and put on both to  
hide the tack, and keep the leader more fast;  
but the edges ought to <sup>be</sup> close pressed to the  
cords.



Then supposing the Mortar to be Com-  
municated and pasted.

Take sheets of thick cardoon paper, and  
with the Compasses cut out Circles each  
equal to the exterior diameter of the top  
of a Mortar; put a Circle at top of each  
Mortar, to prevent dust &c. from  
falling in.

Next, take the interior diameter of a  
Mortar, and if taken at top, make your  
Circles

Circles  $\frac{1}{10}$  of an inch less, because the  
~~Mortar is more than one inch~~

Circle  
for the Top.



Circle  
for the inside



having cut out an inside circle for each  
 Mortar take the exact diameter of the  
 cups of a fuze and setting the Compasses  
 out a inch out of the middles in the  
 sketch above.

Then let a parcel of Air Ballons,  
 eight or more, be brought out of Store  
 in a Basket, covered with a sheep skin,  
 into the work-room; take out two of them  
 and uncoat the fuzes.

Put an inside Circle over the Cup of  
 each fuze, down to the top of the Shell; and  
 give it a turn or two round  
 the Cup, just above the Circle; the use of  
 this tying is to prevent the Circle from  
 slipping.

striking off by any means.

The use of this Circle is to  
keep the face steady over the  
middle of the Chamber, and  
is absolutely necessary for  
safety of the Shell's catching.



Then having a pair of Scales with a  
4 ounce weight and some powder, weigh  
exactly 4 ounces of the powder; next take  
a Mortar, take the top Circle off and place the  
mortar near the light, lift up the Scales and  
pour the powder out of the scale into the  
Mortar, if the scale is held right, the powder  
may be poured into the Chamber without  
grinding.

Bring another Mortar to the light, and  
weighing out 4 ounces of powder, pour it into  
the Chamber of the second Mortar as before.  
then look into the Mortar and draw the powder  
in the Chambers.

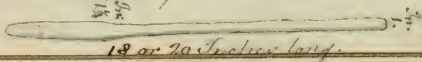
put a Shell into each Mortar, observing

to lay the fuse and circle of Cartronn  
be downwards holding the Shell between  
the fingers and thumb of the right hand,  
put the other Shell into the 2<sup>d</sup> Mortar,  
place the two Mortars by themselves and  
lay on the top Circles.

Take two more Shells out of the bucket,  
uncap the fuses, and fix a Circle on  
each as before; then mixt out the powder  
pouring 4 ounces into the Chamber  
of each Mortar, dress the powder in the  
Chambers, and put a Shell into each,  
fixes downwards; Set these two also  
with the two first, laying on the top  
Circles.

Load and fix two more Mortars in  
the same manner.

Then bring one of the loaded Mortars  
to the light; and having a packing Stick  
of Fir, made thus,



18 or 20 Inches long.

Take

Take waste cuttings of paper, whether brown, brown, or any soft paper, and put a little at each side of the Shell, cut down the paper with the end of the Stick a little tighter put two panels at right angles to the first, setting them down with the stick, then put in small panels of paper to fill up all round, setting them down with the stick; in doing this, the paper must be set in all round pretty tight, so as to keep the shell in its place, taking care to keep the shell upright.

Having fixed One, set it apart and place the top Circle on.

Proceed to fix the other 5 loaded Moulds with paper in the same manner; while this is doing, let a man pack the tops, of each as are fixed, and as soon as any are packed let them be carried into another Room to stand to dry.

The packing the tops of the Moulds differs

differ a little from pasting the tops of  
Pls de Souffrance, pte d'ingrants &c.

For Mortars, single squares of lute  
paper must be cut out, large enough to  
cover over the top circle and about an  
inch over the top edge of the Mortar  
all round; and round the top edge a band  
of pasted double lute paper about 2 lines  
broad, letting the upper edge come about an  
inch over the edge of the circle all round,  
and pressed down every where.

In this manner the Wick is to be carried  
on till the whole are completed.

It is a Rule; to have as few loaded  
Mortars in the work-room at a time as  
possible, in order to lessen the power of an  
accident.

After the Mortars have stood about a  
week to dry, they may be varnished all  
over the pasted places; then they will be  
transplanted.

Having

Having fully described the plain Air-Balloons; we come next to the illuminated Ones.

1.<sup>st</sup> The Shells are turned of Wood used in two hemispheres with a shut joint, in the same manner as for the plain ones, but the dimensions differ, the last being smaller to allow for covering with combustion.

Here the whole diameter of wood Shell is  $5\frac{3}{4}$ ; thickness at the fire-hole  $1\frac{1}{2}$ , and of the other parts of the Shell  $1\frac{1}{4}$ ; the joint as before.



The two parts, when put together ought to form a sphere of the above diameter.

The method of constructing these shells is the same as for plain ones, viz. the joints to be set together with glue; then a coat of canvas laid on with glue and two coats of whitey brown paper laid on with paste; allowing time to dry between each operation.

About

About 2 dozen of these Shells will  
suffice for 1000.

No Harroons to be put in these Shells;  
they are to be filled with Star candy in  
the same manner as the plain ones, with  
 $\frac{1}{2}$  ounce of corn powder and 1 ounce of  
common fire to each Shell.

The fuzes, the same as before; to be glued  
and set in, in the same manner, with  
two or three days to dry.

Then each piece to be carefully primed  
and wired.

Put Circles of Cardboard paper turned out,  
each circle equal to the diameter of the  
top of a furie Cup; rub paste all round the  
rim of the cup and put on a circle, pressing  
it very close every where; and let them  
stand a day to dry.

Then take painted single tube paper, and  
cover about an inch round the top of the  
Shell

Shell and round the side of the furnace, pressing the paper very close; and let them stand for a day to dry.

In the mean time; let 2 Gallons of gum water be prepared, allowing 4 lb. of gum Arabic to each Gallon of water; let it be well stirred with a wood Spatula at different times, till the gum is quite dissolved.

Then tie a length of coarse twine round the neck of each furnace, and dip each Shell into the gum water up to the top of the furnace, but not over it; then lift out the Shell, and let it drain well over the pan; next, tie each Shell when dipped and drained either to lines, or lay them in a tray, so as not to touch one another, for two days to dry, turning them now and then to prevent their sticking to the trays.

Let a quantity of the following Compositions be mixt up in a tray, with a wood Spatula, and some of the gum water  
to

to a middling stiff paste, taking care  
to add the gum water gradually, or a little  
at a time, and to work the composition  
well with the Spatula.

Compositions for Illuminated Bookbonds

N<sup>o</sup> 1.

|                         | lb. oz. |
|-------------------------|---------|
| Salt Petre . . . . .    | 8 : 0.  |
| Sulphur . . . . .       | 2 : 0.  |
| Mealed Powder . . . . . | 0 : 0.  |
| Antimony . . . . .      | 2 : 0.  |

N<sup>o</sup> 2.

|                         | lb. oz. |
|-------------------------|---------|
| Mealed Powder . . . . . | 0 : 0.  |
| Salt Petre . . . . .    | 2 : 0.  |
| Sulphur . . . . .       | 1 : 0.  |
| Antimony . . . . .      | 0 : 8.  |

Each proportion being weighed out,  
must be sifted through a hair sieve  
or linen, and it will be fit for mixing  
up with the gum water.

N<sup>o</sup> 1. is best for covering the Bookbonds,  
and N<sup>o</sup> 2. for small works, or Booklets,  
Illuminated

*Illuminated Manuscripts, and Books.*

Supposing then the Composition to be mixed up with gum water, to lay on the first Coat, take a Shell, (the gum being dry) and with the fingers of the right hand, take up some of the Composition out of the pan; begin to lay on round the face, rubbing it well to moisten the gum that the Composition may stick the better, then lay on the Composition near  $\frac{1}{2}$  thick by gum on all the coarse rubbed part; take up more Composition and rub over again, or two more of the Shell, lay on Compositions of the same thickness as the first, closing them well together by patting with the palm of the hand.

Continuing to rub well, and lay on Composition gradually as piece after piece, when the bottom is to be done, turn the Shell up upon its face, rubbing and coating the Bottom with Composition as before.

In doing this, great care must be taken  
not

not to miss rubbing any part of the shell before the thickness of composition is laid on, and when the shell is covered, take it between both hands, patting and pressing it all over, to incorporate the composition well.

Let the shell be covered on its face in a tray; proceeding to cover the rest exactly in the same manner, and let them stand 3 or 4 days in the shade to dry.

One that is used to it, will cover about 12 in a day.

When the first coat is dry, mix up more composition with the gum water, always working it well with the spatula and the hands to a due temper, neither too stiff or dry, nor yet too wet, then each shell must be covered over with a second coat of composition, in the same manner with the first, taking particular care to rub every part well with

with the composition before the thickness is laid on; which for this second coat may be about  $\frac{3}{16}$ , thick all over, by guess.

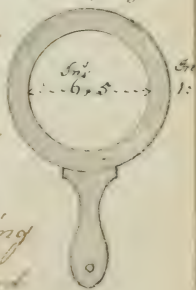
The reason of rubbing every part well is to moisten a little the surface of the first coat, that both coats may adhere firmly together when dry.

When they get their second coat; place them upon their faces in trays, to dry for 3 or 4 days as before.

While the second coat is drying, get a wood gauge turned, either of Elm, or Hainwood, thus,

Wood Gauge.

About  $\frac{1}{2}$  an inch thick; the handle 4 or 5 inches long.



Brass or Iron would be too heavy and dangerous.

Now the second coat being dry, they must have a third coat to complete them.

Use up fresh composition with gum  
resin

water as before directed, and lay it on by rubbing well, making this last coat equal to the top of the piece all over the shell, then pat it well between the hands to compress and make it even all over; try the wood gauge over it in several directions to see how they answer; it might not to fill the gauge by this if the shell is too low, add a little more composition where necessary; if too high reduce it.

Having brought the shell right, roll it all over in dry mealed powder, then pat it all over between the hands to incorporate the powder with the composition. Roll it again in mealed powder, without patting it, then try it in the gauge; and if right, set the Balloon in a tray.

Care must be taken not to make them too high for the gauge.

Each

Each Balloon to be finished with a third coat exactly in the same manner.

I should have observed, that before the third coat is laid on, the paper circles must be taken off the Cups, one at a time as wanted, in order to bring the composition home to the priming of the Cup all round.

When finished, they must stand a fortnight or three weeks in the shade to dry; they must not be set out in the Sunshine at all; for that would crack and spoil them.

When dry, Roll each Balloon up in a sheet of brown paper, and put them in Chests for Store.

To Load the Rockets with Shells, a Success of Corn powder for each as before, then put in the illuminated Air Pistol observing to put the fuse downwards, which may be seen by inspection, for the place at top of the fuse will be flat; then wet in paper all round very carefully with  
the

the packing stick; there must be a circle of Canton paper to cover the top of the Masket and to be finished by pasting in the same manner as the plain ones, but to distinguish them, put a small circle of blue paper pasted, on the middle at top.

Plain Air Balloon completed.



Illuminated Air Balloon completed.  
Usually two Balloons are fired at a time which requires two People.



The Illuminated Air Balloons are too expensive for common use, and only employed in large Firework; 6 of them are quite sufficient; and 12 plain Ones.

# Air Balloons for Signals.

I must premise that the shells are made of cartridge paper pasted and laid one coat on another; their form is Oblong.

The former tapers a little, from top down to the Crown about  $\frac{1}{2}$  a tenth, in order to make it come easy out of the Case.

The Wood Former  
Dry or Fin.



There ought to be 3 or 4 of these formers; and when they are used must be set in a block with a hole in the middle, to let the handle go down.

The first pattern of paper must be cut out just to reach once round and allowing an inch more for the overlap it must reach from the mark at a, to an inch below b, which part must be notched to make it sit close to the former.

The pattern of paper for the Crown must be large enough to reach about an inch above

above the line at *b*; it will be necessary to cut out 3 times as many of these patterns as there are Shells to be made, suppose 12, then 36 patterns.

The former ought to be greased a little all round that part, where the notched parts meet, to prevent the paper from sticking to the Former.

Lay down 3 or 5 of the long papers, and make about an inch broad at one end of each all along, and let them soak 4 or 5 minutes; then put on round a former as tight as may be, and set the packed edge close all along, adding a little fresh paste if necessary; put one in like manner on each former, observing to let one end of the paper be at the notch at *a*, which is turned on purpose at 11 inches from the top of the Crown and so long until the last to be made.

Then paste 6 circular pieces for the crown, laying the paste about 2 inches broad all round the notched edge, and let them soak

as before; lay a circle at top of each groove pressing the notches close all round over the first papers; then lay on a second coat, but one side of the papers must be pasted all over; lay these close every where on the first coat, and let them stand a day to dry.

Next day cut out patterns a little larger than the first, and lay two coats on each pasting one side of the papers all over before they are laid on and let them stand two days to dry.

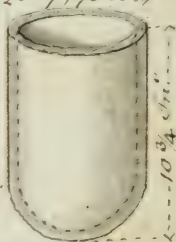
In this manner continue to lay on two coats every third day, till 8 or 10 coats are laid on each and dry; then take these off the Moulds, and begin these more as at first; continuing to lay on two coats of pasted paper at a time, both upon those on the Moulds and those which are taken off, till the Shells are brought to be  $\frac{1}{2}$  an inch thick of paper every where; letting them when completed, stand a full week to dry.

When all the Cases are completed to their proper thickness and thoroughly dry, they must

156.

must be carried to the turner, to be put in the Lathe in order to turn the tops true, taking off  $\frac{1}{4}$  of an inch all round; then the whole exterior length of Case will be  $10\frac{3}{4}$  In; and before turned 11 inches.

It is necessary the Shells, turned.  $7\frac{1}{2}$  In. tops of the Shells should be turned, to form a good joint with the Elm-bottoms.

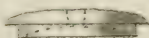


The Shells being thus turned, may be put in Store.

You 3 or 4 of these filled and completed, are sufficient for Store; And, it is necessary to have them, in case the Honble Board should think proper to make any Experiments, the others being too small for Observations.

Supposing then 3 or 4 required to be filled; first, the Elm bottoms must be turned.

turned to fit them exactly.

The Bottom at the fuse. *Elm Bottom.*  
 In: hole  $0,9$ , thick; and at each   
 extremity of the Neck  $0,75$ , thick; the depth  
 of the Neck full  $\frac{1}{2}$  an inch; the neck must  
 fit exactly into the top of the Shell, and  
 the shoulder of the upper part be exactly  
 equal to the exterior of the Shell; the inside  
 is hollowed out about  $\frac{1}{2}$  an inch deep at  
 the fuse hole — the whole difference of Curves  
 at top about  $\frac{1}{2}$  an inch.

These Bottoms ought to be turned out of  
 well seasoned, clean wood — Size of Fuses  
 the same as for the other Air Balloons,  
 and the Fuses with their Cakes are in  
 all respects but one, exactly the same —  
 the only difference being that these  
 Fuses must have a full inch of composition;  
 the others having only  $\frac{3}{4}$  of an inch — See  
 the sketch of the short fuse Page 124.

Having

Having a Bottom turned to fit each Shell; and a number of Fuzes having an inch of composition each.

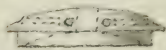
Mark each Shell and its Bottom with Pen and ink, different Letters or figures to know which they belong to.

Then take the Bottoms to the Carpenter and let him with a Stock and Bit, bore holes about 2 inches deep and  $\frac{1}{4}$  of an inch diameter, 6 of these holes opposite to each other, round the edge of each bottom, keeping the middle thickness of the wood, thus;

The Upper Side  
of the Bottom.



The Bottom bored.



I suppose these Hatches are sufficient.

The Bottoms being bored as above, there must be small round plugs of beech made to

to fit each hole so as to drive in tight about 1/2 an inch; these being ready take corn powder and fill one of the holes to within 1/2 an inch of the top, then plug it up tight, in like manner putting corn powder into each hole, and driving in a plug.

Then let the Carpenter take off the ends of the plugs, making all smooth with a Chisel.

Let the Bottoms as far prepared, be taken to the work-room; and fit a Fuse to each by hand, taking care that they fit well and rather tight than slack, leaving the fuses in as fitted; then having hot glue, glue and set in the fuses tight home, as before directed, letting them stand two days to harden well.

Now to complete the wood Bottoms; take a small Gimblet or middle sized broad and some tallow to grease the end of the  
Gimblet

gimblet or brad awl for security; bore  
 to each plug which will direct to the line  
 of each groove or channel, and with a Ruler  
 set off two inches, a little within which,  
 in the inside of the wood Bottom, bore a  
 hole or vent to touch the powder in each  
 groove or channel; then take the finest  
 thread Quickmatch, and cut short pieces  
 about  $\frac{3}{4}$  of an inch long, cutting one end of  
 each piece sloping to a point; put a piece  
 the slope point foremost into each hole or  
 vent, taking care that it goes home to the  
 powder, then with a small round pointed  
 pricker set in a short piece at one side  
 of the first pieces to keep them from in  
 the holes — Quickmatch the vents of each  
 Bottom in the same manner, and they  
 will be completed thus,

Inside of the Bottom  
 quickmatched.

The Intention of all this  
 preparation of the Bottoms



is, that when the Fuse communicates to the inside of the Shell, the Quickmatch of the Bottom taking fire at the same instant, and communicating to the powder in the groove may shatter the Bottom to pieces; For as the wood Bottom weighs upwards of 2 lb: was it to blow out whole; by only the nails giving way, the consequences might be dangerous by its velocity and fall from so great a projection; which danger is by this method entirely prevented.

Having Completed the Bottoms, We proceed to fill the Shells.

First, there must be a wood Bottom or something hollow for the Shell to stand steady and upright in; and a tin tube 1 Inch in diameter and about 1 foot long; Take Stars strung on Quickmatch; Mould Stars large sort; half ounce Maroons covered with Composition 26, and 2 or 3 one ounce Maroons primed only with Quickmatch;

Set

Set the Shell upright on its bottom, and  
 place the tin tube standing up in the  
 middle of the Shell; holding it with the  
 left hand, first put in 3 or 4 strings of  
 Stars rolled in common fire, then put in  
 a quantity of mould Stars all round the  
 tin tube, and about 8 covered or illuminated  
 Maroons, with one singly primed with  
 quickmatch, filling about  $\frac{1}{3}$  of the Shell,  
 set them lightly down by hand with the  
 bottom of a small Mallet; and strow over  
 them about  $\frac{1}{2}$  ounce of common fire with  
 a little corn powder, now the tube will  
 stand without holding — proceed exactly  
 in the same manner to fill a second  $\frac{1}{3}$   
 of the Shell, setting them down lightly  
 with the Mallet, and strowing over the  
 same quantity of common fire with a  
 little corn powder as before — Continue  
 to

to fill the Shell up to the top, at the third time; putting in the Articles exactly in the same order as before).

Then with a funnel pour 4 ounces of corn powder into the tin tube, and drawing out the tube, the powder will remain in the Center—press down the top Stars &c. with the hands adding a few more Stars at top, and strew over 1 ounce of common fire with a little corn powder, about a dram.

Fill the 4 Shells in the same manner.

Next, sort out the prepared wood bottoms by their marks, laying each by the Shell belonging to it.

And having ready hot glue with a small brush; stout nails with heads, about an inch long; a proper sized bradawl with a little tallow, and a brass hammer.

Take one of the Wood Bottoms and with the brush run glue all round the outside  
of

of the Neck and shoulder of the Bottom,  
and put it quick on its own shell filled,  
pressing it close with the left hand; take  
the brass awl, having first dipped the end  
a little in tallow, and bore through the case  
into the neck of the Bottom; put in a nail  
and drive it home with the brass hammer;  
turn the shell quick, and opposite to the first  
nail, bore and drive in a second nail, so  
will the Bottom be steady.

At right Angles to the two first Nails,  
bore and drive in two other nails; between  
each two nails bore and drive in two  
nails at equal distances by guess; there  
the number of nails round will be 12.

In like manner glue and nail on  
the Bottoms upon the other filled shells,  
forcing at a full 1/4 of an inch below the  
top of the Case, and pressing the wood  
Bottom as close as possible to the top of  
the Case — then try the Jaws to see,  
if

if they stand firm, not loosened in shell by the Nailing — It is necessary the Thruer should be fixed in, for if the fire hole was to be left open, part of the Composition, powder and Stave would fly out in nailing on the Bottoms.

All being right, put pieces of brown or whitish linen waste paper into the Clefts of each piece to prevent accidents, and let the Shells stand a day and night for the glue to harden.

Then take Cartridge paper and paste it well over one side, let it lay 8 or 10 minutes to soak; tear the pasted paper into convenient pieces as wanted, and cover all over the wood Bottom, laying one piece close by another, particularly round and a little up about the outside of the Cleft of the piece, and over the joint all round about an inch over upon the Shell, pressing the paper very close all over — lay a second Coat all over upon the

the first, not missing any part, pressing the paper as close and smooth as possible.

— Lay on a third coat of pasted paper, covering, at this third time, all over the Bottom again and likewise all over the Shell intirely.

Each Balloon to be covered with 3 coats of pasted paper exactly in the same manner; then set them in the open air in the shade for 3 or 4 days to dry.

Lastly, the Fuzes must be finished with great care and circumspection; but to avoid needless repetitions, please to observe the Instructions at Page 128: 129: 130: 131.

Oblong Balloon of  $3\frac{1}{4}$  In: Diameter,

|                                 |        |
|---------------------------------|--------|
|                                 | lb: oz |
| Weight of Shell empty - - - - - | 2: 8.  |

|                                 |       |
|---------------------------------|-------|
| Weight of wood Bottom - - - - - | 2: 2. |
|---------------------------------|-------|

Length of Composition in Fuse 1 Inch.

Tar bursting the Shell - Corn Powder 0: 4.

|                       |       |
|-----------------------|-------|
| Common Fire - - - - - | 0: 4. |
|-----------------------|-------|

|                                  |        |
|----------------------------------|--------|
| Weight of Balloon complete - - - | 15: 2. |
|----------------------------------|--------|

|                                  |       |
|----------------------------------|-------|
| Corn Powder for the Mortar - - - | 0: 8. |
|----------------------------------|-------|

The

The Tubes being primed, wired and capped, let the Balloons be put in Place.

The Mortar for these is Brass, 8. in diameter with a small Chamber and lashed as perpendicular as possible to a Ring at top of the Bed.

In my Memory, only two of these have been fired — The first in 1762 as an Experiment by Capt<sup>r</sup>. Hoffman then Assistant Firemaster, this had like to have proved fatal — the Mortar was placed on the Green before the Cadets Barracks, some little Article being forgot I was ordered over to the Laboratory to fetch it, in the mean time the two Foremen of the Laboratory had loaded the Mortar, and inadvertently forgot a principal point, the Powder for the Mortar was in a flannel Bag tied round at top with twine, they had put the Bag into the Chamber just as it was, without untying or opening the Mouth, so that when the Balloon was put in, the tuft at top of the Bag rested against and covered the Edge of the Tubes, in consequence

consequence the Shell went up Blind; the Accident was soon perceived, and every one ordered to keep their Station, we were to the best of my recollection above 2 minutes in suspense, till we heard the whistling of the Balloon in its descent, it fell within about a yard of Capt. A. Hartman and the Shell bursting to pieces covered him all over with Compositions, but providentially did no other damage; the blame was thrown upon me although not present at the time of Loading.

I have taken the Liberty to insert this Accident as a Caution.

If at any future time these Balloons should be ordered; I wish the following method of Loading to be Observed.

Put the naked Powder into the Chamber without any bag, and dress the Powder even at top; Unloose the fuse of the Balloon and see that the priming in the Cup is  
fair

fair, put the Balloon, face downwards, carefully into the Mortar, then walk round to see that the Balloon stands perpendicular, so as to be sure that the legs of the Fuse rest upon the powder in the Chamber; put a Skinskin into the mouth of the Mortar, and for the Light either Quickmatch or a tube may be used.

Loaded in this manner, there will not be the least fear of the Fuses catching; but there ought to be sufficient daylight to see clearly what one is doing; for I can by no means approve of Loading by the Light of a Lantern.

The Second Balloon was fired from the top of Shooter's Hill, by Order of the Honble Board, for the Astronomical Gentlemen at the Observatory in Greenwich Park, at London, and at the Royal Observatory at Hanover, to take an Observation during the Transit of Venus through the Sun's Disk; but I do not recollect the times.

This

170.

This was loaded exactly in the manner just before described, and succeeded well without any accident.

There are likewise Oblong Balloons of  $5\frac{1}{2}$  Inches diameter Length of Shell when turned 7 Inches.

lb. oz

Weight of Empty Shell & wood Bottom. 2:3.

Length of composition in Tube <sup>31</sup> 0, 625.

Coarse Powder for bursting the Shell. 0:2.

Common Fire - - - - - 0:  $1\frac{1}{2}$

Weight of Balloon complete - - - 6:  $1\frac{1}{2}$

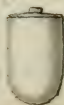
Coarse Powder for their Mortar - - - 0: 4.

The method all through is exactly the same as for the 8 Inch. — Seldom used.

There is one of each Sort complete, in store, with several empty Shells.

As Air Balloons are the most dangerous Articles belonging to Fireworks, I have given very full Instructions, which being closely followed will ensure Success.

Oblong Balloon complete.



## Five Pointed Star Cases.

I must be obliged to consider these separately, in order to a proper Explanation.

The Cases are made of pacted Cartoon paper, rolled upon a wood former, and set in the shade till they are nearly 3 parts dry, or till such time as the former being put into a Case does not stick to the inside; then such Cases as are dry enough, must be taken to the Choking Engine, and one end choked quite close, then the Choke secured with 5 or 6 litches of packthread strained tight.

I am the less particular in describing the Method of Rolling, as that is fully explained in the Article of Four-billion Cases — The Rolling of all pacted Cartoon Cases being the same, all the difference consisting in their size, and that some have vents, and others are choked close, as in the present Case.

The

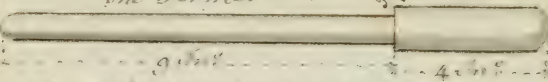
172.

The Former may be turned out of well seasoned beech or Ash wood; according to the following Dimensions.

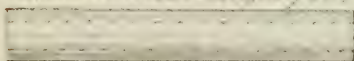
The Former.

$\frac{1}{2}$  In.

$\frac{1}{2}$  In.



The case rolled length 7 In.



The case choked & cut to its proper length.



8 In.

The diameter of the Bore or Concave of the Case is  $\frac{3}{4}$  In. 0,75; and the thickness of paper  $\frac{1}{4}$  In. 0,22:.

The Former must be in the Case at the time of Choking, and when the Case is choked and tied down; set the Choked end on a large Block, and with 5 or 6 smart strokes of an 8 Inch Mallet, on the head of the former set down the Choke a little.

The Cases thus choked and set down must

must be put in a tray and exposed to the wind and shade for a week or 10 days till thorough dry, then they are to be cut to their proper length.

There must be cutters of wood turned larch or ash, to go tight into the case an inch or two - 3 or 6 of them.



Cutter of wood.

Mark off one case by a Rule to 6 In<sup>ch</sup> from the cheek, as in sketch the 3. foregoing, put one end of the cutter tight into the case, and with a sharp knife cut off the superfluous end of the case all round at the mark, as even as you can: take out the cutter and pull off the paper.

Mark off the other cases by the first cut one, and cut them to an equal length, one at a time, in the same manner as the first; these cases may be put in a tray or basket, which when full may be carried  
into

174.

into Store.

Thus the work must be regularly carried on, rolling and watching when any parcel of Cases are fit for blocking, till the whole are completed.

In the large way, it will require five or six hundred of these Cases for Store.

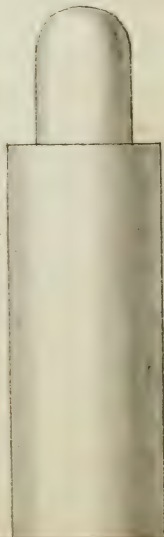
In the next place, they must be stayed at top, with a wood drift turned with a nipple at the end; thus

This Sketch shows the length and diameter of the Nipple, and diameter of the drift in their full dimensions.

In.  
0.75

The length of Body of this drift is 8 inches and length of the handle <sup>In.</sup> 3 $\frac{1}{2}$ .

The Compresses have varied a little in the body.



In the next place, the Cases must be all prepared with Clay; using the Drift with the nipple, one ounce ladle full of Clay, and 16 strokes with an 8 inch Mallet; the clay being drawn, give the drift a small turn to clear and take it out; pour the loose clay, if any, out of the Case and lay the Case in a tray or basket; each Case must be layed in the same manner.

There must be notched brackets proportioned to the size, to set the Case in for Claying; the Brackets need not be latched tight for claying, but just so as to leave room for putting in, or taking out a Case at pleasure.

Without this preparation of Clay, the heads of the Cases would be burnt off before

176.

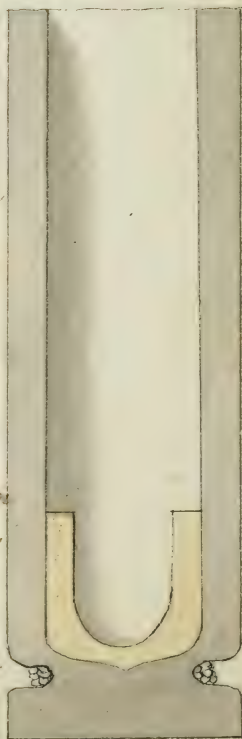
before the Composition could be 3 parts  
extended.

The form of the Case clayed will be  
according to the following Section.

This Section exact  
dimensions, except  
the whole length of the  
case, not having room  
enough.

The cases being all  
clayed; or at least two  
or 300 of them; may  
be drove with composition  
for Store, as they will  
keep good for years

There must be three  
drifts, one as long as



the

177.

the case; the second 4 inches long, and  
the third or short drift 3 inches long  
in the body, all flat at the end with  
brass ferrules; it is once bled and an 8  
inch Mallet; with a small bar of Clay and  
another of Composition.

Composition for 5 pointed Star Cases.

℥<sup>ss</sup> oz.

Healed Powder . . . . . 1 : 12.

Salt Petre . . . . . 6 : 0.

Sulphur . . . . . 1 : 2.

Antimony . . . . . 2 : 0.

The Proportion to be weighed out; then  
sifted altogether 4 times thro' a hair sieve,  
and it will be mixt for use.

To Drive. first a case must be fast  
in the Brackets and lashed close, for  
driving the first time fast in two  
ladlesfull of Composition; then the  
long

178.

long flat ended drift and give 21 exact strokes with the Mallet.

— the reason of putting in two ladlesfull of Composition the first time, is that it may rise above the top of the clay; otherwise if only one ladlesfull of composition, the clay and composition would be beat together by the flat ended drift.

After this only one ladlesfull of composition at a time (stroked) and 16 strokes to each ladlesfull, till the case is drove up to within 10 of the top, then a full ladle of clay drove down with sixteen strokes,

Take out the drove case, and fix another between the brackets, proceeding to drive each case in the same manner, always observing to put in  
two

two ladlesfull of composition into each case the first time with 21 strokes.

All the clayed case to be done with Composition — 2 Men will do in 300 in about 3 days with composition only.

The done case to be put in store.

When any are wanted for firing take the number out of store; then to bore them, there must be a bit and gimblet of the exact size; the Bit according to the following form and size.

The belly of the gimblet next the worm, must be equal to the end of the Bit at a.

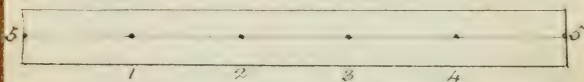
There must be 5 or 6 Bits and gimblets, as it is tedious work.



He

180.

We next proceed to mark off the Case for Boring, thus, cut out a slip of Cartoon paper exactly  $\frac{3}{4}$  of an inch in breadth and 5 or 6 inches long, put the slip round a case and mark where it meets; cut off the surplus end, so that the two ends may exactly meet round the Case, having got the length, draw an exact middle line along the slip, and mark it off into 5 divisions, as in the following Sketch,



This on inspection it is hoped will appear easy.

The 2.<sup>d</sup> Sketch shows the slip put round the Case exactly where it ought to be; the Case must be held in the left hand and



and the slip being put round, the end secured close with the thumb, with a sharp round pointed pricker mark a little into the case at the 5 divisions.

The cases being marked, lay one on a firm part of the table, and place the end of the Bitt on one of the marks made by the pricker and slip, so that the mark may be in the middle of the circular edge of the Bit, as near as the eye can judge, then press upon the Bit moving or turning it a little circularly backwards and forwards to cut out the paper and to touch a little into the clay, proceeding to cut out the paper at the other 4 marks or divisions in the same manner; in doing this, the case must be held steady with the left hand, and the eye directed over the head of the

182.

the case, to direct the bit towards the center.

The divisions of one case being pierced or cut out, take a sharp pointed round pricker and push out the paper and clay from the hollow of the Bit to clear it, which must be done after each case.

All the cases to be hollowed with the Bit in the same manner.

Next, they must be bored out at each hole with the gimlet, thro' the clay and composition to the center; so that by placing any one hole to the light and looking into the rest, one may see the light thro' the middle.

It is hoped, this sketch in Plano Section, is sufficient.



Shen

Then the Cases being bored with the gimblet; paste strips of double tube paper, first stop a piece into the bottom stayed and to fill up; then put a strip round once, leaving enough below to cover over the end, press all close and set them in a tray to dry for a day; if in a hurry they may be tied on to the brackets without waiting for their being dry first.

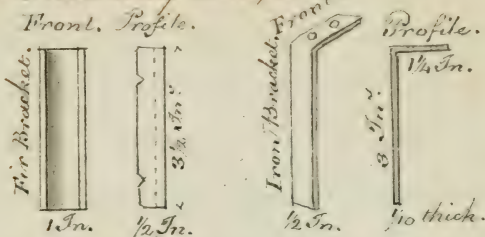
The strips of pasted paper may be  $1\frac{1}{4}$  inch broad and the length of the half sheet; not cut but torn off to the length required, as the rough edges lay closest.

Now let us consider the Brackets and method of tying the Cases on to them.

The Brackets may be either wood

184.

on iron, according to the nature of the Piece they are for.



Fir Brackets are set on the Pieces with glue and 2 nails each — Iron ones are nailed on at the two holes at top.

The cases are tied on upon the Brackets with fine packthread at two places above and below, giving four turns at each place, making a firm knot at the 4<sup>th</sup> turn; then to be covered over the packthread, round the case and bracket, with strips of pasted double tube paper pressed close.

These Star Cases must always stand in a horizontal Position when fired.

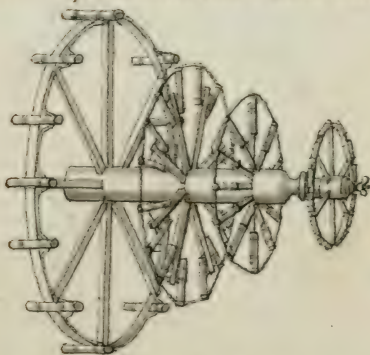
# Regulated Piece.

186.

of 4 Mutations with 5 pointed Stars.

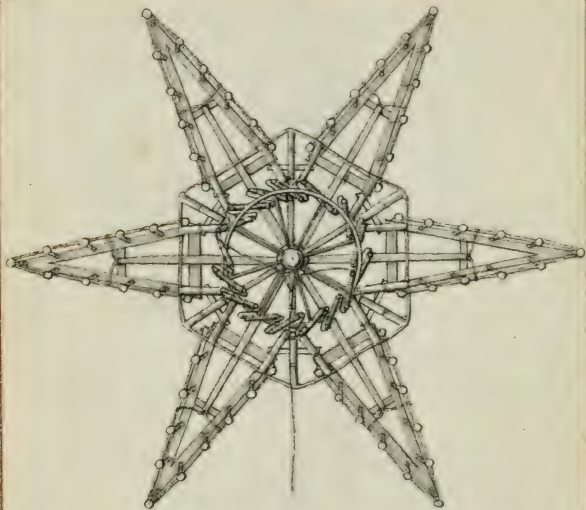


This Sketch represents the Stars burning.



1. A Brilliant Wheel, 12 Cases.
2. A first Sun, Yellow Fire, 12 Cases.
3. A Brilliant first Figure, 16 Cases.
4. A Circle of 5 pointed Stars.

*Regulated Piece  
of 3 Mutations with 5 pointed Stars.*



- N<sup>o</sup> 1. A Brilliant Wheel of 16 Cases.  
 2. A Brilliant Figure of 18 fan Cases.  
 3. Arms N<sup>o</sup> 6, with 5 pointed Stars.

These Sketches are too small to show the Communications properly, which will be explained further on, if a method may be found in so small a Compass.

The 6 Arms screw into the grand Block, and the Method of communicating them will be shown in some Examples.

## CASCADE CASES.

187.

These cases are made of pasted cartoon paper, Rolled on a wood former; the Method of drying and time of being in order for Choking, to be observed as for 5 pointed Star and all pasted Cases.

The Cases are 1 foot long when Rolled; and one Man may Roll about 5 dozen in a day.

The Cases being nearly 3 parts dry, put in a bucket of wood and cut off about half an inch at the end of each Case with a sharp knife to make a smooth end for Choking; there must be two men, one to cut off the ends while the other chokes them.

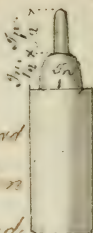
For Choking there must be a nipple of wood to form the Vent, which is equal to  $\frac{3}{4}$  of an inch, the nipple part may be brass about half an inch long.

the C

188.

the handle about 3 inches long.

The Cases must be choked in the Engine, and to have 7 or 8 bunches of middling packthread nearly filling up the choke, then the Case set on a large Block and 5 or 6 strokes given on the head of the former to set up the choke.



form of the Pipe.

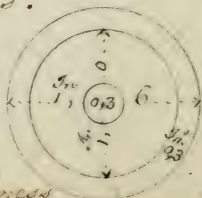
1 1/2 In.

The Cases when Choked, must be set out in the air for a week, to dry thoroughly.

About 300 of these Cases will be a proper Stock.

When any Parcel of Cases are quite dry, they must be cut to their proper length with the cutter of wood and a sharp knife, then put in a Press - total length of Case 10 inches.

This Plano Sketch shows the exterior and interior Diameters, the size of the Vent and thickness



of

of paper.

The interior diameter and length of any Case being known, it is easy to proportion the more and drif for them, which account they are not here inserted, to avoid repetitions.

### To Drive Cascade Cases.

| Composition.          |       | lb. oz. |
|-----------------------|-------|---------|
| Salt Petre            | ----- | 10:0.   |
| Charcole              | ----- | 2:8.    |
| Sulphur               | ----- | 1:4.    |
| Pounded Iron prepared | ----- | 7:4.    |

| N <sup>o</sup> 2. Composition. |       | lb. oz. |
|--------------------------------|-------|---------|
| Salt Petre                     | ----- | 10:0.   |
| Charcole                       | ----- | 2:8.    |
| Sulphur                        | ----- | 2:8.    |
| Pounded Iron unprepared        | ----- | 6:0.    |

To mix the Composition—put the Petre and Charcole together on a mixing table, and let them be well rubbed between the hands.

190.

hands for 8 or 10 Minutes:—

Spread the pounded Iron on another table or a board, and put 8 or 10 drops of spirits of wine upon it, and draw it over with the brass slice for about 2 minutes till the whole is equally damped, then add the sulphur to the iron and draw them over together 5 or 6 times with the slice, put the iron and sulphur to the Petre and charcoal, and mix all well together with the slice for 5 or 6 minutes.

The Pounded Iron is No. 3 and <sup>4</sup> size mixed the same as for 1 Pou. Four billions.

The first composition is generally used on account of its keeping - but No. 2 is much brighter, provided it be fired within 3 or 4 days after it is drove.

There must be 5 Drifts for these  
cases

Cases; one, an inch longer than the <sup>1<sup>st</sup></sup> case, the 2<sup>d</sup>: two inches shorter; the 3<sup>d</sup>: two inches shorter than the second, and the 4<sup>th</sup>: yet two inches shorter. — the 5<sup>th</sup>: about 2 or 2½ inches long, and is only to be used for the clay.

These must be strong fir Brackets to secure and drive these Cases; the brackets must be notched reverse for latching tight, and one of them must be fixed firm in the grand Block for driving on.

The other Articles are; a half pound Rocket Ladle; A 13 Inch Mallet, and a Box full of clay, with another of the Composition.

To prepare the Cases, put a button of brown or whitey brown waste paper into the Tent of each Case, beating the button in a little with a small Mallet.

The Buttons must be put in at the choked end of the Cases, and ought not to

go in beyond the thickness of the tent, least the Composition should set the ends fast, so as to make it difficult picking the buttoms out again.

There are two Methods for Driving, one is to put in a ladlefull of Clay first with 21 strokes of the 13 inch Mallet the second is to drive them without clay at first, this requires no Boring afterwards.

Driving. One ladlefull of Composition at a time struck, and 21 strokes to each ladlefull of Composition with the 13 Inch Mallet, till the Case is drove up to within 1/2 an inch of the top; then put in a ladlefull of Clay drove down with 21 strokes.

All the Cases to be drove exactly in the same manner.

The Cases being drove the buttoms must be pickt out, and if they are clayed at first, must be Bored thro' the clay just clear

clear to the Composition.

Then the Cases are to be primed with quickmatch, first scratching the top of the Composition in each Cont a little with a sharp pointed pricker; putting in four or five pieces of quickmatch of 4 threads, into each Cont, stopping the last Piece tight in with a round pointed pricker to keep the other pieces firm in; then cut off the ends of quickmatch even with the top of the Case.

All the Cases being primed, paste some double slips of tube paper, first stop a piece into the closed end of each Case to fill up; put a slip once round the end of the case, leaving enough beyond the end to cover over the bottom of the Case, press the pasted paper close, and place the Cases in a tray to dry.

When there are to be Marrons at  
the

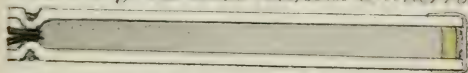
the end, there must be no clay at the end of the cases, that the composition may give fire to the Marroons.

Take  $\frac{1}{2}$  ounce Marroons and prime them with quickmatch, leaving the match about half an inch long—supposing them the bases to be quickmatched at the Vent, paste several slips of double tube paper, about 2 inches broad, and the length of the half sheet—take a case and put a marroon at the open end letting the quickmatch of the Marroon be placed inwards to touch the composition in the case, take a slip of pasted paper and put it round the end of the case and round the side of the marroon as often as it will reach, pressing it close; and to cover the top of the marroon, tear off square pieces of the pasted paper, laying them on 3 or 4 times double one upon another—other

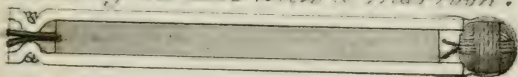
another pressed close; lay the base, and all the cases so pasted with a marroon at the end, in a tray leaning over the edge, for three or four days to dry.

When dry, the Marroons will be very firm.

Section of the Case without a Marroon.



Section of the Case with a Marroon.



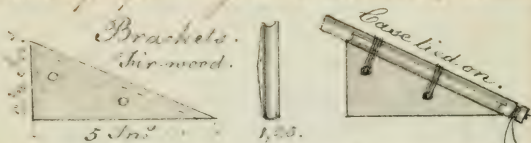
The first Section is clayed at the end but no clay at the Vent which saves Boring—the second Sketch has clay at the Vent and must be Bored; they may be drove either way at pleasure, only consulting time.

A Sketch of the Reamer is omitted as being the same in form as that in Page 92; only proportioned to the size of these Vents.

The

196.

The Cases being all ready, we proceed to tie them on the Brackets with fine packthread — As these Brackets are different from any before shown, it will be proper to give a Sketch of them.



These Brackets are set firm on the Planks with glue and nails; Now let us consider the Planks a little.

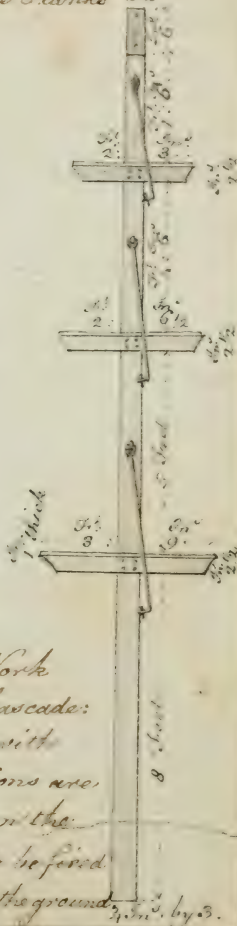
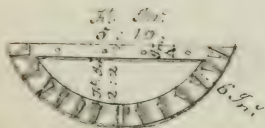
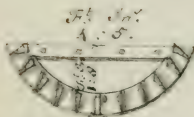
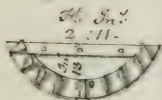
The Planks are made in two general forms, viz. Semi-circular and Circular; Semi-Elliptical and Elliptical; the semi-circular figure is most common; about  $\frac{1}{3}$  of the sweep is taken off.

After the Cases are tied on, the packthreads and over the holes must be covered with pasted double tube paper, then communicated; pasted over the heads of the Cases and leaders — and furnished

Bouquet for  
the top: this  
must be set  
on with screws  
at the top joint  
of the Post.



Sketch of the Post 197.  
with its Stays and Irons  
for fixing the In.  
Cascade Planks  $2\frac{1}{2}$   
on.

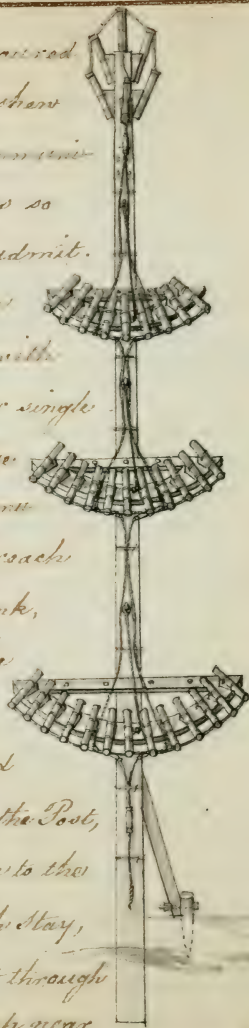


This is all the wood Work  
necessary for a single Cascade:  
the Planks completed with  
Cases and communications are  
not to be fixed, but only on the  
Spot they are intended to be fixed  
at: the Post goes 18 in. into the ground,  $4\frac{1}{2}$  in. by 3.

I have endeavoured  
in this Sketch to show  
the Figures and communi-  
cations, as plain as so  
small a size will admit.

The Planks are  
each furnished with  
two double, or four single  
barrels, to receive  
the principal Commu-  
nications, which reach  
from Plank to Plank,  
and give fire to the  
whole.

The Planks stand  
at right angles to the Post,  
being screwed on to the  
upper edge of each Stay,  
then the Irons put through  
the eye or Iron loop near



the

the Center case on each Plank, and secured with their legs; then the principal communications are to be tied into the Cartridges from Plank to Plank, and to the Bouquet at top, as in the Sketch.

The Post must rest leaning on a breast, while the Planks and communications are fixing - then the hole being dug, the end of the Post must be set into it, and raised upright by a sufficient number of hands who are to keep the Post steady, while the earth is flung in and rammed hard all round; then there must be a fir-brace about 2 inches thick and 7 or 8 feet long with a short beech picket at one end drove into the ground; the top of the brace being fast to the back of the Post.

When intended for Reprises, the bottom of the Post must be tapered to the thickness of the Framing.

# Antique Circular Cascade.

Here there must be two Stays at each division, to screw the two Planks on; that they may meet by means of a notch in the middle of each plank, thus, —

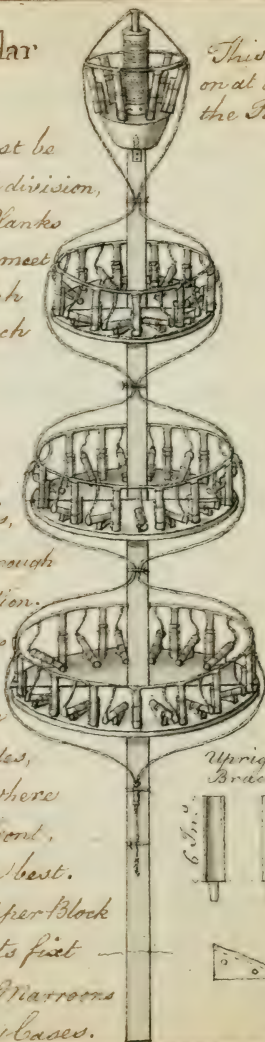


The rest, with the Communications is, it is hoped, plain enough upon a little Inspection.

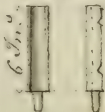
Circular Cascades are proper, where there is room for the Spectators on all sides, as Tower Hill &c. — where there is only one front, Single Cascades are best.

At top of the upper Block is a Pote d' dirigeto fixt — with Stars — no Marroons at the end of these Cases.

This screws on at top of the Post.



Upright Bracket.



# PUMPS OR ROMAN CANDLES.

First I beg leave to premise, that the upright Cases on the foregoing Circular Cascade, may be Pumps if thought proper, only they must be timed, that is they must burn the same time as the Cascade Cases.

Pump Cases are made of pasted-Cardoon paper, managed in the same manner as other pasted Cases, and like the 5 pointed Stars must be checked close at one end.

## Large Pump Cases.



Total Length of Case  $11\frac{1}{2}$  In.

Diameter of Bore  $0,85$  In.

Total diameter of Case  $1,2$ .

Thickness of Paper  $0,175$ .

These are made to receive the largest Mould Stars, and if smaller Cases are wanted, they must be made in proportion to the lesser Natures of Stars.

It must be observed that the Cases as first Rolled, must <sup>be</sup> a foot long, to allow for Choking and Cutting.

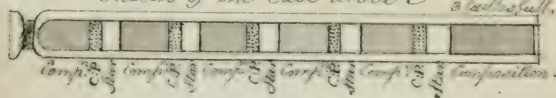
Supposing then, the Cases to be rolled, choked; but to their length, and being quite dry, put into Store, about 3 or 400 of them.

When any are wanted to be drove in, Take My Rocket Composition: Corn powder and Trisulphate to fit the Case; and for these long Cases there must be 4 drifts: A 2 ounce Ladle and an 8. Inch Mallet.

Fix a Case between proper notched Brackets on a great Block; first put in one ladlefull of My Rocket Composition, then the long drift with 3 or 10 moderate strokes of the Mallet; then put in another ladlefull of Composition, driving it down in the same manner; Next, put in a stroked ladlefull of corn powder and upon that

that a Mould Star Plateways; then put in a full ladle of Composition, driving it down with 8 or 9 moderate strokes as before, then another ladlefull of Composition drove down; again a stroke'd Ladle of corn powder and on that a Star, Next pressed with two ladlesfull of Composition as before, and so alternately, Composition, Corn powder and a Star, till the Case is full up to the top; the top or last ladlefull must be Composition.

Sketch of the Case drove - 3 ladlesfull.



There are 5 divisions for Stars; C.P. signifies Corn Powder.

It will be proper to drive one Case first for a trial, to see how the Ladle answers to the intended divisions, and if a little more or less Composition is necessary to fill up properly, it may be easily regulated by taking a somewhat larger or smaller Ladle.

The Cases may be drove all alike, or varied at

at pleasure; the number of divisions or Stars, not being arbitrary; but six Stars in each Case, are as many as can well be got into the length of the Case.

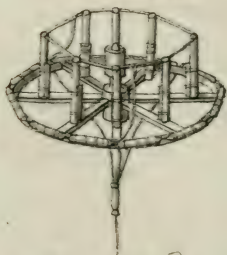
There are two Methods of Fixing these Cases when drove; viz: 1.<sup>st</sup> by having holes bored in the wood work with a Center Bit, large enough to admit the choked end of the Case; in these holes the Cases are to be fixt with glue — 2.<sup>d</sup> they may be tied on to Brackets in the usual manner, and the packthreads covered all round with pasted double tube paper.

These Cases must always stand upright or perpendicular in all Figures.

And when they are to accompany other Cases, they must be made to keep the same time — Suppose them to be fixt on a Balloon Wheel 3 feet diameter, containing 12 four ounce Wheel Cases, 3 to burn at one time to turn the Wheel, then the sequence

sequence of Cases will be 4, and the Pump Case ought to burn as long as 4 Wheel Cases drove with Brilliant.

Balloon Wheel.



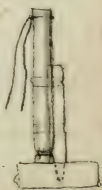
The form of these Wheels may be varied at pleasure, viz<sup>t</sup>. two Rows of Cases one above another with a small Pot d'airgret at top.

The Circle of Cases at top are supposed to be pump Cases, tied to Brackets which are set on the spokes of the Wheel; as 3 Cases burn at one time, there must be communications from the leaders at top of the pump Cases, to two of the first Cases

Cases on the Wheel, the ends of those two leaders must be fixed into the cartouches of the Cases together with two of the fork leaders, that the three first Cases and the Pumps may all catch fire together.

For tying on the Communications at top of the Pump Cases, each Case must have a string tied round near the top leaving the ends hanging down about 6 Inches; all first Cases with and without Chokes, must have like strings of Coarse twine.

There is a number of Pump Cases in Store, though they have never as yet, been introduced in any Laboratory Fireworks.



The two following Sketches of Pieces may be proper for Pump Cases.

# EXPLANATION for this *PIECE*.

The Planks or Boards  
for Fixing the Caisse on  
are made of fir about  $1\frac{1}{2}$   
Inch thick, the holes bored  
with a Center bit, and the  
Caisse set in with glue.

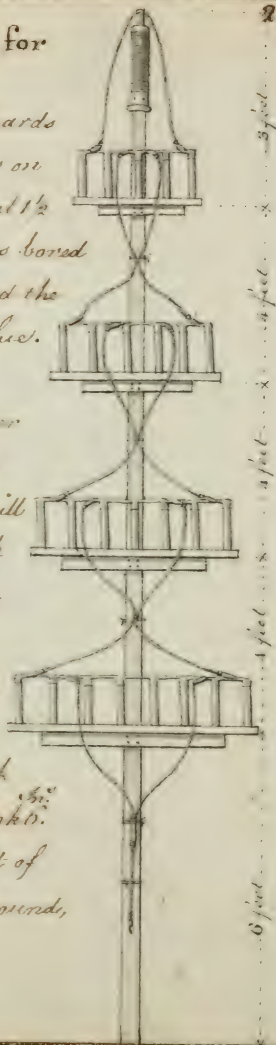
For the Lengths.

Supposing the lower  
Plank to be four feet  
long: the 2.<sup>d</sup> Plank will  
be  $3\frac{1}{2}$  ft. — the 3.<sup>d</sup> Plank  
3 feet; and the upper  
Plank  $2\frac{1}{2}$  ft.

For the Breadths.

the lower Plank  $15\frac{1}{2}$  In.  
2.<sup>d</sup> Plank  $1\frac{1}{2}$  ft. 3.<sup>d</sup> Plank  
 $9\frac{1}{2}$  In. and the upper Plank  $10\frac{1}{2}$  In.

The whole Height of  
this Piece from the Ground,  
21 Feet.



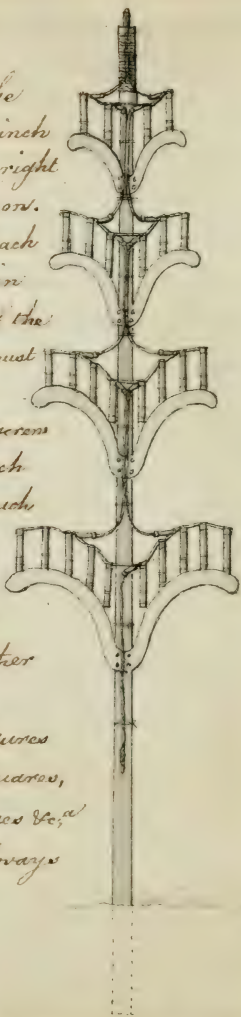
# EXPLANATION for this PIECE.

The Curves ought to be made of Elm about an inch thick; with flat, iron, upright Brackets to tie the Cases on.

The whole Breadth of each Curve or Serele may be in proportion with those of the foregoing Piece — there must be braces or cross pieces,

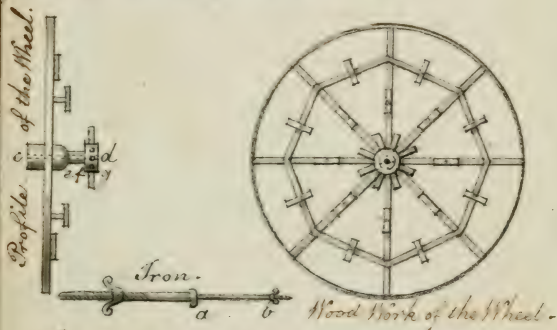
and rubs on the post to secure the Curves on to — and each Curve must project so much before each other, that the Cases may throw up their Stars without striking against the other wood work.

A great Variety of Figures may be contrived, as Squares, Circles, Octagons, Ellipses &c,<sup>a</sup> but the Cases must always stand upright.



# WHEELS in Azure Fire.

The Wheel for these are made in a particular form, and may be from 3 to 5 feet in diameter; it will be proper to give a Sketch of the Wheel.



The first Article is to get the Block *cd* turned, which should be laid down and cut out in cartridge paper, as a Pattern for the Turner to work by.

The length of the Block *cd* may be about 6 inches for 3 foot Wheels and  $3\frac{1}{2}$  inches diameter — from *c* to *e*,  $3\frac{1}{2}$  inches; from *e* to *f*, 1 Inch; and from *f* to *g*,  $1\frac{1}{2}$  inch.

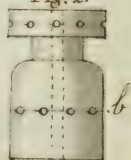
The

The Block being turned, must likewise have the mark round for the Brackets and be bored through, the diameter of this hole may be about  $\frac{5}{8}$  of an inch, viz:

This first Sketch shows the Elm block as it comes from the Turners — a and b, are the marks for boring the Holes at.



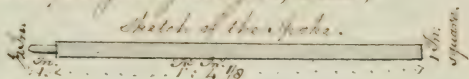
Fig: 2.



Before the holes are Bored, it will be necessary to divide round at the marks a & b, into 8 equal parts with a pair of Compasses, observing to let the marks for the lower holes stand between each upper one, as in Fig: 2: the holes are then to be Bored with a  $\frac{1}{2}$  inch Center bit, as straight as possible.

Next for the 8 Spokes, to find the length of each spoke; supposing the diameter of the block to be  $3\frac{1}{2}$  inches, and the Ash-hoop  
which

which goes round the Wheel to be 6 thick;  
 then the diameter of the block being  $3\frac{1}{2}$   
 inches, and the hoop's thickness twice taken  
 is  $\frac{3}{8}$ , which added to  $3\frac{1}{2}$  makes  $3\frac{5}{8}$ , this being  
 subtracted from 3 feet leaves  $2;9\frac{1}{4}$ , the half  
 of which is  $1;4\frac{1}{8}$ , for the length of each spoke,  
 but the spokes must each be an inch longer  
 than the foregoing length, thus,



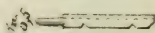
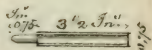
The Hub at the end of the spoke, must be  
 turned to fit tight into the hole of the block,  
 the spokes being ready, must be set in the  
 holes of the block with glue, as at b in  
 Fig: 2: but one side of each spoke must stand  
 upwards, thus  $\square$ .

While the spokes are drying, the hoop may  
 be prepared, which is usually of ash,  
 about  $1\frac{1}{4}$  inch broad and  $\frac{1}{8}$  or  $\frac{3}{10}$  of an inch  
 thick; as the hoops are seldom long enough  
 to reach round in one piece, they must be  
 planed

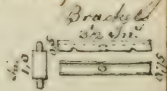
planed taper and spliced together with nails. the hoop is secured round at the end of each spoke, by first boring with a bradawl and then driving in a 3 penny nail, the two ends must be spliced with nails as before.

Then for the 8 Brackets round the top which are to be made as follows,

the hollow may be about  $\frac{1}{8}$  of an inch deep; these brackets are to be set into the holes with glue, in the same manner as the spokes.



Now for the 16 Brackets which are upon the Wheel, viz. 8 upon the spokes, and 8 upon the octagonal Brace which connects the spokes, these are made in the following manner,



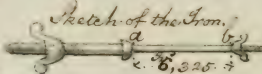
The small upright has a pin turned at each end, of  $\frac{1}{2}$  an inch diameter and  $\frac{1}{2}$  an inch long, on one end the Brackets are fixed with glue, the other end goes into holes

hole made in the Spokes and Braces with a Center bit, and set in with glue.

And to complete the Wheel, there must be two circular pieces of plate brass about  $\frac{1}{10}$  of an inch thick; in the middle of each plate a hole must be bored not exceeding  $\frac{1}{2}$  an inch in diameter, and each plate must have four holes at right angles, for setting them on the ends of the block with nails, *Brass Plate.*

The only particular in setting  on the plates, is to take care that the middle hole of the plate be placed exactly in the middle of the hole of the Block.

Now the Brass plates being each  $\frac{1}{10}$  thick the Wheel block will be lengthened  $\frac{2}{10}$ , for the Plates are not let in.

Here the Spindle  part of the Iron a b, that is from the shoulder at a, is the Nut at b, must be at least  $\frac{1}{8}$  of an inch longer than the length of the wheel block and plates, which is  $\frac{6}{8}$ , 2; the  $\frac{1}{8}$  of an inch more is to allow the Wheel a little play — General Rule.

The

The Spindle part of the Iron a, b, may be  $\frac{3}{8}$  of an inch in diameter, and the part behind the shoulder  $\frac{6}{10}$  in diameter, and about 6 inches long, the screw part being 4 inches of the size — this for 3 feet Wheels.

The Spindle part for 5 feet Wheels may be  $\frac{1}{2}$  an inch in diameter; and the back part behind the shoulder  $\frac{3}{4}$  of 5 diameter.

And lastly, the Wheel must be tried upon the spindle, if the holes in the plates are not big enough to let the spindle pass thro' freely, they must be reamed a little larger, till the spindle goes freely through.

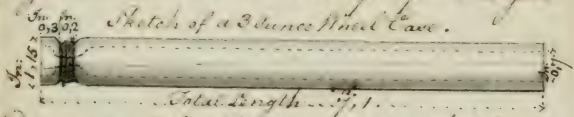
Having made the Wheel and fitted it to its spindle, we shall proceed next to fix it with Cases.

And first, of the Cases which are to go round the Hoops, and keep the Wheel in motion when fired.

These Cases may be 3 Ounces, made of pasted Cartoon paper, pasted and Rolled  
in

in the usual manner, then let to be half dry, and then choked, there must be a wood Nipple for forming the Bents, which is equal to  $\frac{1}{3}$  of the Bore of the Case—when Choked, they must be exposed to the air till quite dry, and then cut to their proper length.

Sketch of a 3 ounce Steel Case.



Diameter of the Bent equal to  $\frac{1}{3}$  of the Bore.

Here the diameter of the Bore is  $\frac{7}{16}$  In. and the diameter of the Body of the former will be  $\frac{7}{16}$  In. — the Former turned out of Beech or Ash, in the usual manner.

As above, the Case completed is  $\frac{7}{16}$  In. but when first Rolled they ought to be 3 or 3  $\frac{1}{2}$  In. long, to allow for Choking, cutting &c.

Supposing the Cases to be ready for Driving—first put a plug of brown paper into the vent of each Case, setting it in a little with a Mallet.

The Cases must be first prepared, before

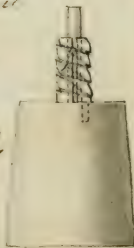
before they are drove, there are two Methods for it.

First, there must be of those Brackets which have been so often mentioned for driving Cases in, it may be proper once more to give a Sketch of them, viz;

In this Sketch, a is the loose Bracket, and b the fixed Bracket as may be seen by the dotted line; the Notches are reversed in order to keep the loose Bracket from rising—the grand Block is of Elm about 2 feet high; 1 foot diameter at top, and about 16 inches at bottom.



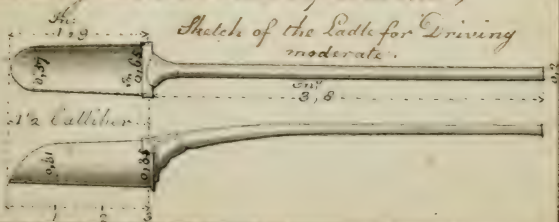
In this Sketch, the Case is put in between the Brackets, which for preparing the Cases in, are only to be laced just tight enough to put in or take out a Case at pleasure.



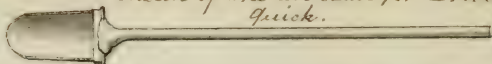
Next

Next for the Drifts, of which there ought to be four — the Body of the longest 7 inches in length; the 2<sup>d</sup> drift 6 inches long; the 3<sup>d</sup> drift 4 inches long; and the 4<sup>th</sup> or short drift about 3 inches long; all solid and having brass ferules at the end — the length of each handle about 3 inches, and the diameter nearly equal to a Case: the diameter of the Body of each drift, must be very little less than the Bore of a Case, just enough to let the drifts go in easy — the Drifts to be turned out of Beech or Ash.

Again for the Ladles, which may be and are made of iron; there are two sizes of them, viz: one for moderate time; and the other for Driving quick, where time is short; the following Sketches will explain this,



*Sketch of the tin Saddle for Driving Quick.*



*1 Caliber.*

Wherever the word Caliber occurs, it is always to be taken equal to the exterior diameter of a Case; the transverse and depth are the same as before.

• 10 inch Mallet, a square box with Clay, and another full of common fire, viz.

**Common Fire, for Preparing of Cuscs.**

Ox: dr.

Mealed Powder \_\_\_\_\_ 12: 0.

Charcoal \_\_\_\_\_ 2: 0.

Salt Petre \_\_\_\_\_ 0: 12.

Sulphur \_\_\_\_\_ 0: 4.

This Proportion being weighed out; First rub the Petre and Charcoal together between the hands, then put the mixed Charcoal and Petre, powder and Sulphur altogether into a hair Sieve; and sift them four times through

through, and it will be mixed for use.

The reason of mixing the Charcoal and Petre together between the hands first: is to prevent the Charcoal, being a light Body, from flying about in clifting.

Having all the foregoing Articles in readiness, and the Cases having their tents stopped with buttons of paper, put in a Case between the Brackets, take the Saddle of  $1\frac{1}{2}$  Caliber and dip it full of Clay strike off the superfluous clay above the edges with a bit of small cane or round stick, put the ladlefull of Clay into the Case, then the long Drift and give 21 smart strokes on the head of the Drift with a 10 Inch Mallet; take out the long drift and clear the end from any clay that may stick to it; next, dip a ladlefull of the common fire composition, not striking any off with the small bit of cane, put the ladlefull of composition into the Case, and then the long drift with 21 strokes of the Mallet; put in another ladle of composition full as before, and 21 strokes of the Mallet; then take out the drift, and the

the Case cut of the Brackets, lay the two apart, continuing to prepare each Case exactly in the same manner.

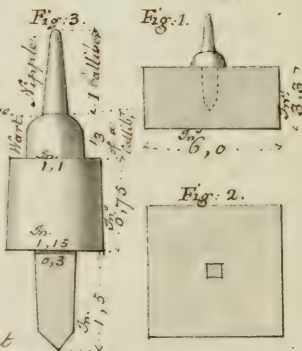
The second Method is hollow, and there must be a block and iron Nipple in the following Form and Dimensions Fig.

Fig: 1. Shows a rough Nipple set in the Elm Block, out of use.

Fig: 2. is only to show that the Block is square.

Fig: 3. Is a Sketch of the iron in present use.

The <sup>nipple</sup> spindle as above is 1 Caliber long; at the bottom next the Wart, it must be about  $\frac{1}{2}$  a length more in diameter than  $\frac{1}{3}$  of the Bore of a Case; and from thence tapering to  $\frac{1}{2}$  of the bottom diameter at top; the diameter of the Wart must be fully equal to the Bore of a Case. The Shank at bottom <sup>In.</sup> 0,3, square.



Now

Now the end of the long drift must be hollowed equal to the length of the <sup>nipple</sup> spindle, and in such proportion as just to go down freely over the Nipple,

Sketch of the long hollow Drift for preparing of Cases.



Now to prepare in the hollow way; first, there must be no plug of paper put into the vents of the Cases — Set the square block with its iron nipple <sup>to</sup>, be placed upon a grand <sup>an</sup> block about 20 or 2 feet high; take a Case and set it on upon the Nipple down upon the Mart, giving the Case as it were a turn to set it fast on.

Use the same tin Ladle as before, taking up a ladlefull of clay and strike it even with the small bit of cane, put the ladle of clay into the Case, then the long drift and give 21 smart strokes with the 10 Lb Mallet; take out the drift, and holding the hollow end over the box of clay, strike on the head of the drift with the Mallet, to clear out the clay from the hollow

hollow, the striking must be continued, till nothing more flies out; having cleared the drift, lift up the square Block with Case &c, letting the Case be downwards over the Box of Clay, pour out what loose clay happens to be in the Case (there always will be a little) and replace the Block with Case &c.

Then put in a ladlefull of the common fire composition, not struck even; next put in the long hollow drift (care must be taken to put the drift gently down into the Case; for if put down hastily, it will drive the composition out <sup>at</sup> of the top of the Case; general Rule) then give 21 strokes with the mallet; take out and clear the drift over the Composition-box; then put in another ladlefull of Composition, and drive it down with 21 blows of the Mallet; continuing ladlefull after ladlefull, till you can see no print of the top of the Rippile, in the composition in the hollow of the drift.

Then put in a full Saddle of composition, and take the 2. long drift which is solid, and  
drive.

drive down the last ladlefull of composition with 21 strokes of the Mallet.

. Now to take off the prepared case; put the left hand upon the square block, and seizing the case with the right, give the case a turn round towards you; which will loosen it so as to make it come easily off the Nipple; lay the prepared case apart, and proceed to prepare the rest exactly in the same manner.

**Cautions.** very great care must be taken, always to clear the hollow drift thoroughly, after driving each ladlefull of composition; let the Head be always kept upright clear of the drift in driving, as in case of an accident a blow on the forehead with the drift, might prove fatal; As the Cases when prepared, are usually laid in flat trays to be carried into store, let not above 8 or 9 dozen be kept in the working room at a time; No talking or discourse to be, during this Work or Driving as it withdraws the necessary Attention.

We had one Man, tho a careful hand,  
that

that actually lost his Life at this Work, being burned to death, the Case he was preparing, by some accident took fire, and communicated to 3 or 400 prepared Cases in a tray, besides other combustibles in the room — For this Reason I had rather be blamed for Repetition, than neglect of usefull precautions.

In the large way, it is proper to have 5 or 600 of these Cases at least, ready prepared in Store.

Supposing then, the Cases to be prepared in either way; the next Article is to drive them with proper

### Composition.

lb. oz.

Mealed Powder ————— 1 : 0.

Salt Petre ————— 0 : 4.

Sulphur ————— 0 : 1.

This proportion to be weighed out; put all together; and then sifted 4 times through a hair Sieve.

Now it will require 12 Cases for the Wheel, viz.<sup>t</sup> 10 open, and 2 Clayed at the end.

First.

First, to drive the Cases when prepared in the Brackets — put in a prepared Case between the Brackets, lashing the Brackets tight with the Line; then take the same tin Ladle as used for preparing, and put a ladlefull of the foregoing Composition, struck even, into the Case, then the long solid Drift, with 21 smart strokes of the 10 Inch Mallet; thus continuing to put in one ladlefull of Composition at a time, first struck even with the bit of cane) and 21 strokes with the Mallet to each ladlefull, till the Case is down with composition up to within  $\frac{3}{10}$  of an inch of the top; then unlash the Brackets, and take out the drove Case laying it apart — put another Case in and lash it tight, proceeding to drive it with composition exactly as the first, using the shorter drifts in course as soon as they will reach the Composition in the Case to drive it down properly.

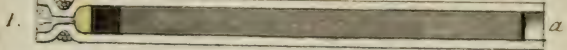
Second. to drive the Cases prepared on the Nipple — let the square Block with iron Nipple

Nipple, be placed on a grand Block as for preparing, put a prepared Case on the Nipple light and upright, with a bit of a turn round from you in setting it on, then the method of driving is still the same, viz: one struck ladlefull of Composition at a time; with 21 Strokes of the Mallet to each ladlefull, till the Cases are drove up with Composition as before — to take the Cases off the Spindle when drove, is only to give the Case a bit of a turn first to loosen it, then it will come off easy.

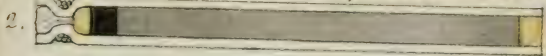
The drifts for driving are solid for both Methods — the long hollow drift being only used for preparing.

It has been before observed, that 2. of the Cases must be clayed at top, which only means, that after the Cases are drove to their proper height with composition, there must be a ladlefull or two of Clay drove at top of the Composition, to fill up the Case; because the two clayed Cases are the last that burn upon the Wheel, and conclude it.

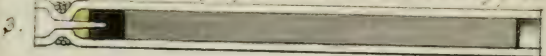
Section of a Case, prepared & drove in the Brackets.



Section of a Case Dillo... Clayed at the end.



Section of a Case, prepared & drove on the Viper.



N<sup>o</sup> 1, Represents an open Case, that is, there is no clay at top of the Composition at the end, a.

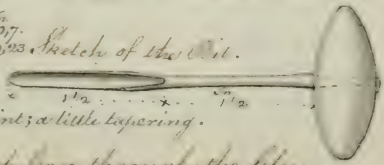
N<sup>o</sup> 2, Represents a Case clayed at the end, and is usually called a dead head.

N<sup>o</sup> 3, Represents an open Case, as N<sup>o</sup> 1.

Cases prepared and drove between the Brackets as N<sup>o</sup> 1 & 2, must be bored with a Bit equal in diameter to  $\frac{1}{3}$  of the Bore of the Case, viz,

First, with a round sharp pointed pricker pick the buttone or plug of paper clean out of all the Vents, then with the Bit,

Bore of Case  $\frac{5}{16}$ .  
 $\frac{1}{3}$  of Dillo — 0,23. Sketch of the Bit.  
 at about  $\frac{3}{4}$  of an inch from the point; a little tapering.



Bore each Case through the clay

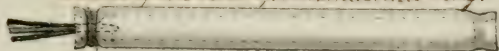
at the Vent, just a little into the common fire but not above  $\frac{1}{2}$  a tenth of an inch — the Cases being Bored, to prime them.

There are two Methods of Priming the Cases, Viz: Long and short, both which it is proper to Explain. Viz:

Long priming — first with a small round sharp pointed prickler, scratch the Composition in the Vent of the Cases a little, then take good 4 thread Quickmatch, but if there are any Remnants of ends good and long enough, use them first, cut off a short length of about 2 $\frac{1}{2}$  inches, put one end into the vent home to the Composition, then take a round pointed prickler and put it into the vent, put in another piece of quickmatch as far as it will go; make room with the round pointed prickler again, and put in a third piece of match, then take a short piece of match, double it and lay it at one side of the vent, forcing it tight in with the round pointed prickler, to keep the other pieces tight in the vent; then cut off

off the ends of quickmatch, leaving the rest standing about 1 or  $1\frac{1}{4}$  inch beyond the end of the Case, thus,

*Sketch of the Case Quickmatched long.*



*Sketch of the Case Quickmatched short.*



In Quickmatching long, care should be taken not to bruise or break the Quickmatch, but the ends ought to stand out stiff, therefore the blade of the picker should be at least 2 inches long from the handle.

Quickmatching short, is performed in the same manner, only not using such long pieces of quickmatch, and leaving the ends standing about  $\frac{1}{4}$  of an inch from the end of the Case.

It has happened, that a necessary operation which should precede Quickmatching, must be mentioned here, which is, that after the Cases are drove, they must be taken to the Choking Engine, and the open ends choked a little in; as may be seen in the above Sketches, this is done in order to tie in the Cartouches firmly.

The

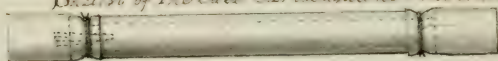
The Cartouches, are slips of tube paper broader or narrower as required, and long enough to go 3 times round a Case — the length of the Cartouches must be according to the distance between each Case, that the Wheel will permit; in the 3 feet Wheel, the long Cartouches may be about 14 inches in length.

The short Cartouches need not extend more than 1/2 inch beyond the end of the Case, just enough to gather together to tie in the Leaders.

Sketch of the Case Cartouched long.



Sketch of the Case Cartouched at both ends.



The Cases thus differently Cartouched, are for two distinct Methods of Communication, as will be shown farther on.

Now before the Cases can be put together in the first Method, or tied on upon the Wheel in the second — it will be necessary to find the Circumference of the Wheel, to know the exact distance between each Case.

Then by Calculation; the Wheel being 3 feet  
in



It may be proper in the next place, to explain the Method of putting the Cases together in Saucisse.



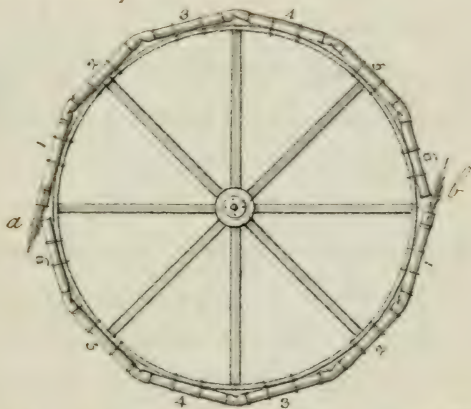
Into the long Cartouch of the first Case at  $a$ , put two or three ends of quickmatch  $1\frac{1}{2}$  inch long, then put the quickmatched end of No. 2 Case into the long Cartouch, so far in, that the distance between the end of the first Case at  $c$ , and the head of the second Case at  $b$ , may be just equal to the length of the Gauge  $2, 4$ . then with three turns of coarse twine tie the Cartouch into the Choke of the 2<sup>d</sup> Case at  $b$ , tight all round, Cut off the ends of twine, and tear off the end of the Cartouch all round just beyond the tie,

In like manner put in pieces of Quickmatch into each Cartouch, and tying in the Cases one after another, till the Saucisse of 6 Cases is completed, the last Case being a dead head or clayed at the end.

The second Saucisse of 6 Cases must be prepared.

prepared exactly in the same manner.

The next step is to tie the bases upon the Wheel, but first it may be necessary to explain which way the Wheel ought to work or turn when fired.



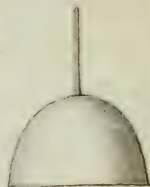
In this front sketch of a vertical Wheel, the two first bases *a* & *b*, are represented burning, in order to show how the Wheel ought to turn;

When the Wheel has made half a revolution, the first base *b*, will move round downwards till it comes up to *a*'s place; and the first base *a*, will move round upwards till it comes down to *b*'s place — All vertical Wheels to be fixed; so

as to turn round directly in the same manner;  
and all Horizontal Wheels to turn directly contrary.

To tie the Cases on the Wheel, there should  
be a Block and Spindle thus,

on this Spindle the Wheel is to be  
placed in a horizontal position,  
only taking care to let the front  
side or face of the Wheel be upper-



8 In: High: Bottom:

most.

The Block and Spindle is very convenient  
for turning the Wheel round at pleasure, and  
handy for fastening.

Begin with tying on the first Case of one  
of the Lancifers, let the quickmatched end of the  
first Case be placed towards the right hand,  
holding the Case to the hoop with the left hand,  
put the packthread 3 times round the Case  
and hoop, pulling them tight and at the fourth  
turn, secure with a knot, cutting off the ends  
near to the knot, at about 2 1/4 inches from  
the first tie, put the packthread 3 times  
round the same Case, pulling them very  
tight, and concluding the fourth turn with

a tight knot as before, in like manner tying each twice as may be seen in the foregoing sketch of a Wheel with the Cases tied on.

Having tied on the first Saucisse of 6 Cases, take the Gauge bit of leader 2, 4 long, and apply it to the end of the clayed base of the first saucisse tied on, letting the head of the first Case of the second Saucisse, be at that distance from the end of the clayed case; then tie on the Cases exactly in the same manner as the first — See the sketch page 233.

Care should be taken in tying on the Cases to keep the Cartouches tight, but not to burst them.

Now it must be evident, that by this method, the Communications from Case to Case are completed by means of the Cartouches, for as soon as the Composition in the first Case is expended, the flash communicates to the two or three pieces of quick match put into the Cartouch and from them to the long quick match in the Vent of each Case; and so successively from one Case to another.

The

The Cases being tied on, the next Article is to paste them; and first to tear out the paper, the half sheet of tube paper, makes 8 slips lengthways, for covering over the packthreads, and for covering the Cartouches, divide the half sheet lengthways into 6 slips.

Then there must be a pasting Board of fir, about <sup>2 $\frac{1}{2}$  ft</sup> 2:6 long; <sup>10 in</sup> 10 wide, and <sup>3 $\frac{1}{4}$  in</sup>  $\frac{3}{4}$  of an inch or a little less in thickness; first with the brush paste all over one side of the Board, laying as many single narrow slips on near one another as the Board will contain, paste all over the first slips, and then lay another slip on each of those slips, and paste them all over as before; this is called pasted double tube paper; this narrow sort is for covering and securing the packthreads.

Take off the pasted slips of paper from the Board, and hang them upon the Wheel in readiness.

Put a whole slip round over each packthread as often as it will reach, and press <sup>it</sup>

it close all round with the hand having pasted or covered all the packthreads.

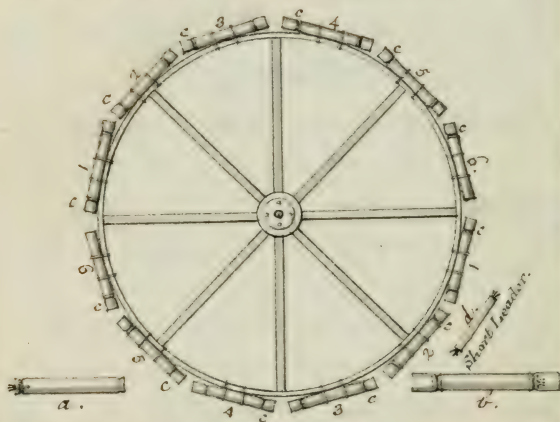
Lay down some slips of the broad papers and paste them double as the narrow ones, with these cover each Cartouch once all over, this is usually performed with three pieces  
Fig<sup>r</sup>



Supposing a & b. to be the length of the Cartouch, then put a slip round between the hoop, and bring up the end over part of the Case at a; so that one edge of the pasted slip may be about  $\frac{1}{2}$  an inch beyond the tie upon the Case, as may be seen by the dotted line, set the first end close and bring round the slip to cover about half an inch over the first end, and tear off the paper there, pressing the pasted paper close down all round the Case and part of the Cartouch, likewise put a piece round at b, in the same manner, and lastly, put a piece round the middle of the Cartouch at c, covering over the inward edges of the two first pieces and press all close; in this manner all the Cartouches are to be covered over with  
pasted

fracted double tube paper, leaving no part of the Cartouches uncovered; the two short Cartouches on the two first Cases, are not to be fracted at this time — then the Wheel to be set by to dry, till the Blue Cases are ready for fixing.

Now to show the other Method.



In this Sketch, the Cases are represented as tied on singly, at equal distances from each other, by means of the Gauge piece of Leader. In<sup>y</sup> 2, 4, in length; the numbers show how the Cases follow each other in order; and the Letter c, shows the quick-matched end of the Case in its right position.

position, great care is required in this placing the quickmatched end right; and therefore we always, either look into the Cartouches for the quickmatched end of the Case, or feel for it with the end of the finger — it mistakes in this point spoils the Wheel.

A, represents the Case quickmatched short, as they must all be in this Method.

B, represents the Case with a short Cartouch at each end — the two last Cases N<sup>o</sup> 6, have only a short Cartouch at the quickmatched end, the clayed end or dead head of these two Cases, must be well secured with double pasted paper, laid on over the ends at least 3 or 4 times double, to prevent the fire of the two 1<sup>st</sup> Cases, from burning through to the Composition; all the packthreads may at the same time be covered all round with the narrow double pasted paper as in the first Method.

In the mean time the short Leaders may be prepared and quickmatched as the Sketch D; it is only measuring from the open end of one Case

to

to the quickmatched end of the next, these may be a little longer than the gauge for tying on, about  $\frac{1}{10}$  of an inch more.

It will require 10 of these of an equal length quickmatched as in the sketch; making room with the round pointed prickler to put in a short piece or two at each end; cut off the ends of quickmatch at about  $\frac{1}{4}$  of an inch from each end of the leader.

To fix the Leaders or Communications, first bend the quickmatch a little at each end, put one end into the open end of the first Case to touch the composition, gather the Cartouch together round the leader, and tie in that end of the leader with two or three turns of coarse twine put round near the end of the gathers of the Cartouch, put the other end of the leader into the Cartouch at the quickmatched end of the second Case, so that the quickmatch at the end of the Leader may touch the quickmatch at the head of the Case, then gather the Cartouch round the leader and tie in the end as before, finishing with a knot and cutting off the ends of twine nearly close, this tying should be but barely tight, for if <sup>it</sup>

it should be tied very tight, it might suffocate the quickmatch in the leader and so stop the communication or at least produce a report like a pistol, which ought to be carefully avoided.

All the communications to be put in from case to case, and tied in the same manner, only taking care that none of the folds of the cartouches get between the ends of the cases and quickmatch at the end of the leaders.

When the communications are all tied in; they must be fastened over with double paper, covering over all the cartouches and leaders and a little over each cartouch round the case — the cartouch at the quickmatched end of the two first cases are not to be pasted.

In the two foregoing sketches of Wheels the Brackets for the Blue cases are omitted, to avoid confusion of lines; the plain Wheel being judged best to show the Method of tying on; Communicating and pasting the Wheels.

This Work may be done any time beforehand, as 1, 2 or 3 months, for the Composition in the Wheel cases will not spoil; and therefore in  
 large

large Works, much of the strong white fire is used for the Wheel Cases of all Illuminated Wheels, in order to forward the work as much as possible.

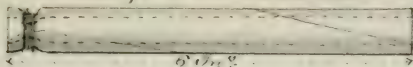
N.B. There are but the two foregoing Methods of communicating the Wheel cases; though there is great variety in placing them round the Wheel; Some Wheels have Brackets fixed round the hoop all in one oblique direction; others again have their Brackets alternate, one up, one down, for half the Circumference, and the other half in a line with the hoop; with several other varieties which will be explained in Order.

---

Now I come to treat of the Blue Cases; - which, for Wheels of 3 feet diameter, may be those of 2 ounce; and for Wheels of 5 feet diam; may be those of 3 or 4 ounce parted Cases.

The 2 ounce Cases are to be Rolled in Houles in the same manner as those for Friction and Vertical Wheels; but these differ in their Vents which must be wide, viz; the Bore

Bore of a 2 ounce Case being  $0,52$  in<sup>diameter</sup>,  
 then the diameter of the Tent must be  $0,82$  in<sup>diameter</sup>.  
 Sketch for the 2 ounce Case.



there must therefore be a wood Right<sup>Angle</sup>  $0,32$  in<sup>diameter</sup> for forming the Tents of these Cases in Choking.

The Tents of the 3 and 4 ounce packed Carton Cases are wide in proportion—viz<sup>t</sup>: the Bore of a 4 ounce Case being  $0,75$  in<sup>diameter</sup>, the Tent must be  $0,45$  in<sup>diameter</sup>—and the Bore of a 3 ounce Case being  $0,7$  in<sup>diameter</sup>, the Tent must be  $0,4$  in<sup>diameter</sup>;—the Pasting, Rolling, Choking and all the work is exactly the same as for Rolling other packed Carton Cases, the only Difference being in the size of the Tents.

The whole length for these 2 ounce Cases is 7 inches; and for 3 ounce Cases  $6,5$  in<sup>ches</sup>.

Supposing then the Cases to be completed ready for Driving.

First, if two ounce Cases, they must be drove in the Mould they were Rolled in.

If packed Carton Cases, they must be drove in wood Brackets proportioned to them.

IF

If buttons of paper are put into the Vents it will do; but care must be taken not to let the end of the Button go in beyond the inside of the Vent, if they do it will not be easy to pick them out again, after the Cases are drove.

But I would propose to have a  $\epsilon$  Mould purposely for these 2 Ounce Cases, the foot of the  $\epsilon$  Mould to have a flat nipple on it thus,  
 Diam<sup>r</sup> of small Nipple at top,  $0,32$ .

Height of small Nipple - - -  $0,5$ .



And for the 4 and 3 ounce pasted carton cases, would propose a brass nipple to be fixed in the grand Block at the foot of the first Bracket, thus,

The Nipple  $a$ , for 4 Ounce Cases

Diameter - - - - -  $0,45$ .

Length or height - - - -  $0,6$ .



The Nipple  $a$ , for 3 Ounce Cases,

Diameter - - - - -  $0,4$ .

Length or height - - - -  $0,6$ .

The length of the part  $b$ ,  $0,75$

and its diameter equal to that of a Case.



This would prevent waste of paper and time in making and setting the Buttons in the Vents.

To

To Drive the Cases, first

Rayonnant Fire. Composition. lb.

Healed Powder \_\_\_\_\_ 6.

Salt Petre \_\_\_\_\_ 6.

Sulphur \_\_\_\_\_ 3.

This proportion to be weighed out, then sifted altogether 4 times through a hair Sieve.

Some of these Cases to have any Clay drove at their Vents.

And each Case to be drove with this Composition, up to half of the interior length of the Case; the other half to remain for the Blue Composition.

For 2 ounce Cases — One two ounce ladlefull of Composition at a time (struck) and 16 smart strokes with an 8 inch Mallet to each ladlefull of Composition.

For 4 and 3 ounce pisted Cases; one in Ladle, ( $1\frac{1}{2}$  diam. long) full of Composition at a time; and 16 or 18 strokes with a 12 or 10 Inch Mallet, to each ladlefull of Composition.

— All the Drifts must be solid.

In the large way it is usual to have at least

two

two or three hundred of each of these Cases in Store, drove half full with the foregoing Composition, for this Rayonnant fire grows better, by keeping drove some time.

Supposing then, the Cases to be ready half drove with the foregoing Composition.

The Number of Cases wanted for the 3 feet Wheel will be 3 times 8 or 24; and for a 5 feet Wheel about 40.

Blue Composition. lb. oz. dr.

Salt Petre \_\_\_\_\_ 1 : 0 : 4.

Healed powder \_\_\_\_\_ 2 : 1 : 0.

Sulphur \_\_\_\_\_ 0 : 8 : 4.

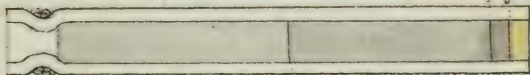
Trunk filings \_\_\_\_\_ 3 : 0 : 0.

To mix this Composition, Sift all together 4 times through a hair Sieve.

Then the Method of Driving is the same for each Nature of Cases as before, viz<sup>t</sup>. the same Ladle; the same Mallets and N<sup>o</sup>. of Blows to each ladlefull of Composition as before till the Case is filled up to within  $\frac{3}{4}$  of an inch of the top — let all the Cases be

be drove up with the blue composition to the same height — then take yellow Specchi composition, and drive a ladlefull of it, at top of the blue composition in each case; and lastly, finish the driving of each case, with a ladlefull of clay or a little more, if necessary, to fill them up.

Sketch of the Case drove.



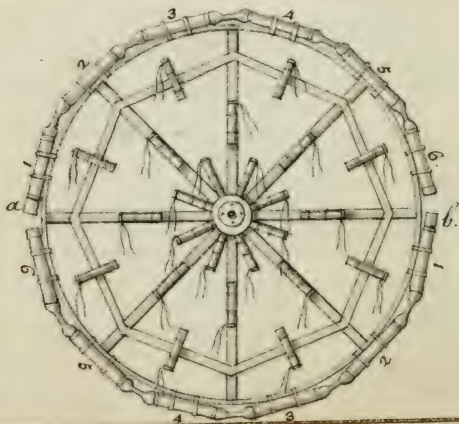
Rayonnant fire. Blue composition.

The cases being drove according to this sketch, to prime them with quickmatch, is done in the usual way.

First pick out the buttons of paper from the vents; take a case and with a sharp pointed pricker, scratch the composition in the vent a little, and then prime with short pieces of quickmatch, putting in one piece beside another making room with the round pointed pricker, and lastly stopping in a piece tight at one side, to keep the rest firm; then cut off the ends even with the end of the case; the cases being all thus primed, let

let the end of each case be covered over with  
pasted double tube paper, stopping a piece in  
above the clay, and putting part of a slip once  
round, coming about  $\frac{1}{2}$  an inch down from the  
end and covering over the end.

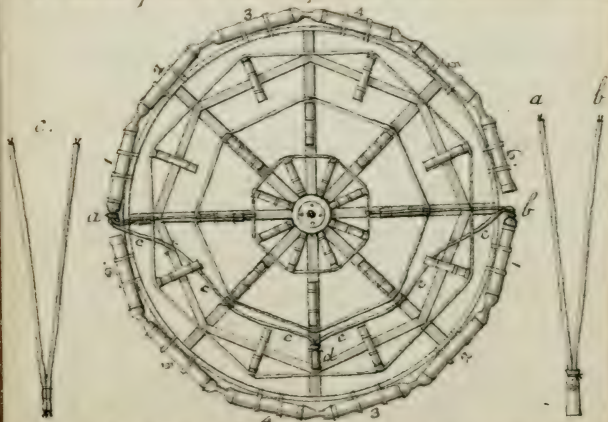
The Cases may then be tied on upon the Brackets  
if two ounce Cases, with 4 turns of coarse twine  
round the case and bracket at each notch; If 3  
or 4 ounce pasted Cases, they must be tied upon  
the brackets with three or four turns of packthread  
at each notch; and then all the ties to be covered  
round with the narrow pasted double tube paper;  
then the Wheel will stand thus,



The foregoing Sketch of the Wheel so far completed, must be supposed laying in a horizontal position on the block and spindle; a Perspective Sketch appeared to me, would have been too confused.

For this Sketch likewise, the strings are shown as set round the choke of each Case; they may be set on with a single or double hitch, but usually single to save twine — coarse twine is best, and the ends to hang down about 4 or 5 inches, for tying down the leaders, at each side of the Case.

A Sketch of the Wheel Completed with Communications.

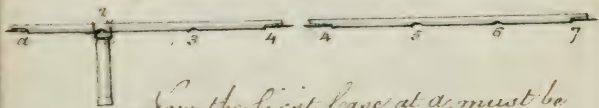


c. is the Forked Leader quickmatched and tied together.  
a. b. is the Forked Leader with its varrished Cartouch.

The forked Leader a, b. the end of the Leader a, must be put in along with the end of the Leader coming from the blue bases, into the cartouch at a, *N<sup>o</sup> 1*, and the cartouch being gathered together, secure them with two or three turns of coarse twine — the end b. of the forked Leader, must be put into the cartouch at b, *N<sup>o</sup> 1*; along with that end of the leader coming from the blue bases, and secured in the cartouch b.

Then the other part of each of the fork-leaders must be regularly and gently bent at proper places, avoiding any sharp turns) and gently tied to the spoke; as may be seen in the sketch of the Wheel completed; where the letters c, c, c &c. show the placing and tying of the forked leaders; and d shows the varnished cartouch at their end, which is tied down upon the middle spoke below — Into this cartouch one end of the long Communication (consisting of 3 Leaders in length) must be tied, where the Wheel is properly fixed, to give fire by.

The Leaders for communicating the blue Cases, may be those of tube paper for communicating Speech is, provided the Wheel is not to be carried far — but in Cases of distance, sticking &c.<sup>d</sup> it will be best to use cartridge paper leaders, as they will resist accidental violence better; the Method of communicating round the blue Cases, is performed in the same manner as for Speech, by measuring from Case to Case, and marking the leader at the top of each Case as far as the leader will reach, then cutting small holes in the leader at the marks with a pair of scissors, always ending at top of a Case, and cutting off the spare length of leader, fig.



Now the first Case at a, must be marked to know which to begin from, or else the notches and holes will not answer; then the notched end of the leader at a remains untied till you come round to it — the hole of the leader 2, being placed at top of the second Case, must be  
 tied

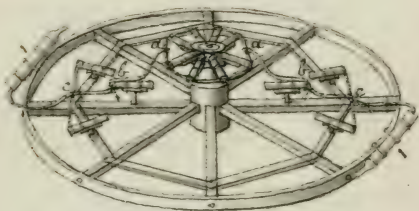
lid on each side of the Case as at fig: 2 in the foregoing Sketch of the Case and Leaders, at 3 it must be tied in the same manner; then at 4:4. put the end of the quickmatch of the second leader a little way into the end of the first leader and slip the paper of the second leader up under the first, till the end of the notch comes close to the side of the Case at top, but the notched end of one leader must be short, so as to come half way over the top of the case, and the end of the other leader must be long enough to reach about  $\frac{1}{2}$  of an inch over the top of the case; so that the twine may catch it to keep the short end down which must always be under the long end.



I have endeavoured in this Sketch to make the joint of the leaders at 4 as plain as the Size will admit; the principal point is, to take care that the ends of the quickmatch join well; then proceed to tie down 5 and 6—at 7 take another leader, marking it as far as it will reach, cut the notches at the ends one short the other long, and

and likewise the holes, run a length of good 4 thread quickmatch through the leader and make the joint at 7 the same as at 4, tying down at each case alike, thus continuing leader after leader quite round, completing the last joint as the former, in this manner forming the three octagonal communications.

For the cross Communications, one end of which reaches into each of the Cartouches of the first wheel Cases —



In this Sketch of part of the Wheel and Case, intended only to show the method of the cross Communications — first at a, a, with a sharp knife cut a small notch in the leader open to the quickmatch thereon; at the head of the opposite Cases b, b, through the leader cut a small notch just to the quickmatch and likewise at c, c, cut a small notch

notch just to the quickmatch, all in a right line, then take a leader, and notch one end about  $\frac{1}{2}$  an inch, put a length of good quickmatch thro the leader, and at the notched end of the leader, cut that end of the quickmatch to a slope point, then at the notch of the communication at a, make room with the round pointed pricker and put the slope end of the quickmatch a little way in, as at the notch a,

put the end of the quickmatch b, into the notch; bend down the paper at the end of the leader, and tie it crossways as at N<sup>o</sup> 2, with fine twine.



Bend down the leader gently to the top of the case b, and there tie it, produce the leader along to the head of the case; and there bend it down gently, mark the leader at the middle of the top of the case; and lifting up the leader a little, with a small sharp knife cut a small notch in the leader, exactly answering to the notch in the leader at the head of the case; bend down the leader again, and give two turns of twine round the

the choke of the case and leader, making a single tie under the choke of the case; bring up the ends of twine over the leader at the underside of the case and secure with a double knot, cutting off the ends of twine. produce the leader along to the notch in the communication at C, and mark the leader, then lift the leader up a little, and cut a notch underneath, to come exactly upon the other notch, tie them together crossways. bend down the leader gently to the top of the spoke, and there tie it with two turns of coarse twine round the spoke and leader, tie it again near the hoop — then try what length will just reach into the cartouch to touch the quickmatch in the first case, cut off the leader to that length, and with the scissors slit the end of the leader up about  $\frac{1}{4}$  of an inch, cut off the paper all round, not the quickmatch, then with the round pointed prickler make room, and put one or two short pieces of quickmatch into the end of the leader; then bend the leader into the cartouch, leaving it so — in like manner the opposite cross communication must be managed.

Then the fork leader must be prepared and  
fixed

fixed as before directed.

This being done, the Wheel must be pasted all over the head of each case, round the choke of each case, and round the leader close to each side of the cases, also at all the joints and ties of the cross communications and fork leaders; the pasted paper may be double but should be only once laid on, yet so close that not the least opening may be left for any fire to get in by accident; then set the wheel to dry, after which it may be varnished.

Now it is evident, that the fire from the long communication, as soon as it reaches the quick-match in the cartouch of the forked leaders, runs along them to the two first cases, and at the same time gives fire to the two cross communications of the blue cases, which by their connection with the octagonal Leaders, give fire to all the blue cases at once — It is usual to have two of these Wheels both to fire at one time.

To fix the Wheels for Firing. Put the iron of the boltorn through the block of the Triangle, put on the Nut and screw it up by hand, then  
if

if necessary, turn the flat face of the top of the Column in a line with the front leg of the Triangle, then with a wrench, set the nut up very tight at bottom of the block, to keep the Column steady; during this and fixing the Wheel, the Column must lean upon a wood trussel — having secured the Column very tight, take off the back Nut of the Wheel Iron or Spindle, and put the end of the iron through the hole in the flat face of the Column near the top, generally a block  $1\frac{1}{2}$  or 2 inches thick is necessary, this Block must be put on the iron close home to the Back of the Column, then put on the Nut and with the wrench set the Nut tight up to the back of the block making the Spindle as steady as possible.

Unscrew the small Nut at the end of the Spindle and take it off; let two men lift up the Wheel and put it upon the spindle thro' the holes in the brass plate of the block, then screw on the small Nut, and set it tight with a small turn of the wrench, taking care not to bend the spindle — Give the Wheel two or three turns, to see that it works or turns round free and easy; then give several turns with

coarse twine round the end of the screw and over the ears of the nut, to secure the Nut from working off, this being done — take a long Communication of three Leaders in length, and put the open quickmatched end thereof, into the Cartouch of the forked leaders, putting it home to the quickmatch in the Cartouch, then gather the cartouch together, and tie in the end of the leader with two or three turns of coarse twine or packthread.

Bend the Leader gently down to the Column clear of the Wheel, and at about 14 or 16 inches below the Wheel, gently tie the leader to the Column; with two or three turns of packthread, then tie it again near the bottom of the Column.

Now, Let the Stand and Wheel be raised upright in the following manner — two men must stand with their feet against the bottom of the hind legs of the triangle to prevent their slipping, One man to take hold of the front leg of the triangle which he keeps pulling at and opening out, while three men behind push it up by the Column; there should be

one Man to look and direct the person at the front leg of the Triangle, either to ease out or push in the leg — the Piece being raised up, it will be proper to see that the Wheel faces the place from whence it is principally to be seen, and likewise that it stands in the best place of direction; if not it must be moved, and then set as upright as the eye can judge by moving in or setting out the front leg of the Triangle, then tie the end of the long communication to the front leg of the Triangle — it is very proper to tie the leader, to secure it for firing at pleasure; which could not be the case, if the Leader was to hang loose and any wind to blow it about.

To give fire, is only first to pull off the small cap of varnished paper at the end of the long Communication, and then apply the Portfire.

For raising up pieces moderately heavy, we use poles 10 or 12 feet long with a fork of iron at top in the following form,



with these forks, most of the heavy Wheels and

Regulated

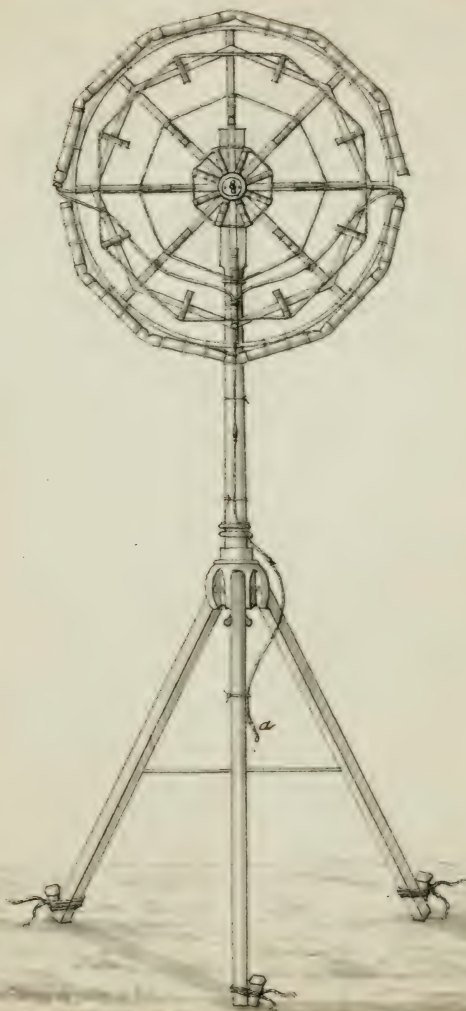
Regulated Pieces are raised up, for after the piece is a little raised, two or three men clasping their forks against the back of the Column, and under the block and iron behind, will push more than 6 men can below, their purchases being short.

In the opposite Sketch the Wheel is represented compleatly fixed for Firing, and it is only to pull off the small cap of varnished paper at a, just before the Portfire is applied.

In this Sketch is likewise shewn the Method of driving short pickets, which are to be lashed to the bottom of each leg of the Triangle: this is often necessary, where there are heavy Pieces and strong fires; particularly in horizontal Wheels, for they shake the Stands very much.

The Effects of this Composition is sometimes blue and sometimes green, much like the flame which arises from melted brass or gun metal.

Remarks. If two Ounce Cases are used, they must not be drove above 3 days, before they



they are fired; for at the expiration of that time, they become so hard that the blue composition will not burn at all.

The 3 and 4 ounce lasses will not keep good above nine or ten days, for then the blue composition becomes hard and uninflammable.

I have been informed, that by keeping the Wheel in a warm room where there is a fire; the blue lasses may be preserved a considerable time, but tho' this should be the case, it would be troublesome and dangerous, and in some places impracticable.

The Blue composition grows remarkably hard in the lasses at the expiration of the above time, so as to resist a moderate blow with a hammer, and when put into a smith's forge, tho' the fire be excited by the bellows, the composition does not burn, but only becomes red hot like a piece of iron or a flint stone; and no observable tendency to vitrify.

The Effect seems produced by the antipathy between Sulphur and Linck - the Sulphur consuming that Semi-metal intirely.

## RAYONNANT or WHITE FIRE.

Having in the foregoing Description of the Blue Wheels, given the Rayonnant or white Fire Composition, together with the method of Driving them; shall only beg leave to observe.

That for all Regulated and Trial Pieces, 2 ounce Cases only are used — of these there are two Lengths, viz: the Short being  $6\frac{3}{4}$  long, and the Long sort, 9 Inches in length.

The Vents of both are alike, and exactly the same as for the 2 ounce Cases, for the blue Wheels.

And the Cases to be Rolled and Driven in Houles.

As these Cases are much employed, on account of their keeping — It is necessary to have some hundreds of them always ready to use in Store.

Their application is various as judgment and fancy direct and the effect always beautiful, the body of the fire being white and the Rays yellow, like the Sunbeams, from whence it is called Rayonnant Fire.

The

The following sketches represent some of the many figures in which these bases are used.

A small Sun in these bases looks very well; about 10 inches diameter; and there might be a Range of them, as 5, 7 or 9.

Fig: 1.<sup>st</sup>

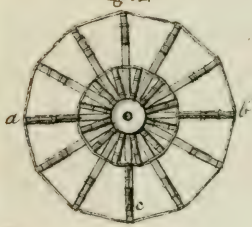
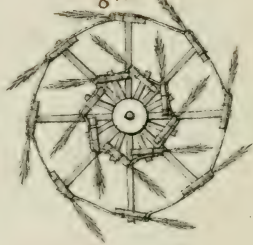


Fig: 2.<sup>d</sup>



Length of Block 4 1/2 in.

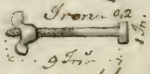
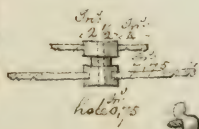


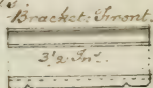
Fig: 1.<sup>st</sup> Represents a double Sun, consisting of 24 short 2 ounce bases in Rayonnant Fire; completed with its Communications; Cross Leaders, and Cartouch for tying in the first Leader to give fire by.

a, b, show where the Cross Leaders are placed; and at c, is the Cartouch; coming upon the top of the lower base, the Cartouch is fixed on the end

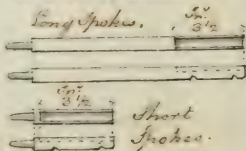
and of a short leader, one end of which is connected with the communication of the interior circle of Cases.

Fig: 2: Represents another figure in Rayonnant Fire; the Block is the same as for the long, but the Spokes have flat Brackets  $3\frac{1}{2}$  inches long, and  $3\frac{1}{5}$  broad: thick or deep  $\frac{1}{2}$  an inch; thus:

These Brackets are fixed on the upper side of the Spokes, near the end, with glue and Nails, in such an equal direction, that the fire from each Case may be clear of the end of the next Case, which may be easily seen in the Sketch, in which the Cases are represented burning; these Cases throw out the gold Rays about 3 feet in length from the head of the Case; the setting on of the Brackets in an equal direction, is easily done with a Bevel.



For the short Fig: 1<sup>st</sup> the end of each Spoke is hollowed and notched to serve for Brackets, thus: the hollow about  $\frac{2}{5}$  deep, and the Pins at the end of the Spokes  $3\frac{1}{5}$  long; and  $\frac{1}{2}$  an inch in diameter; set into the Block with glue.

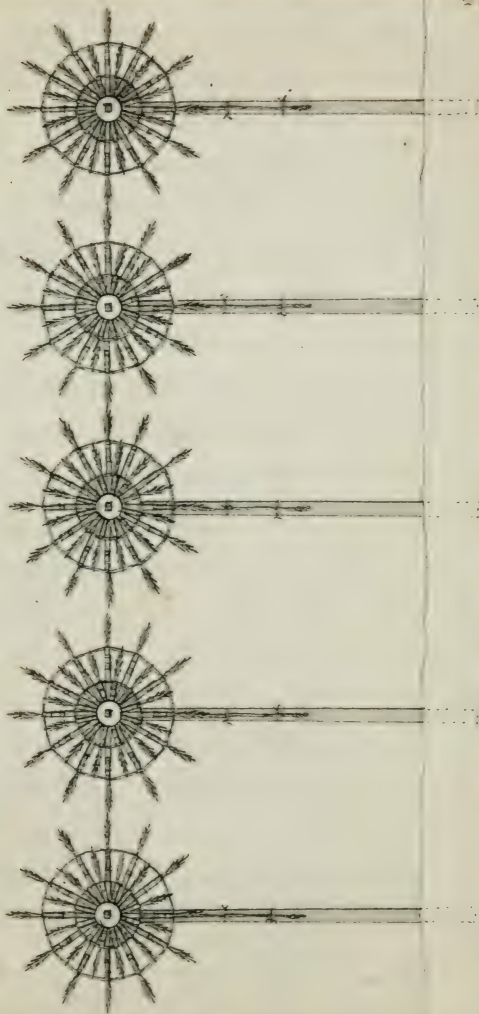


When

When all the Cases are tied on, the pack threads must be covered with narrow slips of double tube paper pasted; and likewise when all the Communications are finished, the heads of the Cases; round the Choke behind the leader; at each side of the Case round the leader; and at all the joints of the Cross leaders and Cartouch leader, must be covered once over with pasted double tube paper; so close every where, that no opening may be left for an accidental Spark to endanger them: and when the Pasting is dry, the Pieces may be varnished.

Supposing then a Range consisting of five of these Pieces; to fix them for Firing, is only to take off the Nut from the Iron, and then putting the iron through at the front of the Block, and through the hole at top of the Post or Stand; put on the Nut and screw it up tight to the back of the Post or stand; only letting the Cartouch be downwards, to tie in the first leader which being done, and then brought down and tied to the Post — let the Post with its Piece, be raised upright, and then the earth rammed tight all round, to keep the Post steady.

*Sketch of A RANGE of small SUNS in Raymont Shore.*



In the foregoing Sketch of a Range of small Guns; the pieces are represented. Bearing in mind the Figures, and likewise they have all their Communications — Also in the Sketch the horizontal Line of Fire nearly touches, which ought to be 6 or 8 feet apart; and to have sketched them in that proportion; the Figures would be too minute for Inspection.

There must be a man to each Piece, who are to take the Signal from the man on the Right, that they may all fire together.

The Posts may be about 10 feet long;  $3\frac{1}{2}$  by  $3\frac{1}{2}$  at bottom; and  $2\frac{1}{2}$  at top; the hole for the Iron about  $6\frac{1}{2}$  In: below the top; the bottom of the Posts need not be above 14 or 16 In: in the ground.

When they are to be put up and fired in a Garden upon a Grass plot; it will be proper to have triangles with columns for them; or feet for the Posts, to prevent digging any holes.

This Range is a Variation; instead of a Range of Garbs; Pale de Sauciforne, or disgreets with Bouquets, &c.<sup>a</sup>

End of the Second Volume.

# INDEX to the Contents.

| <i>Specchis of all Natures.</i>                                                | <i>Page</i> |
|--------------------------------------------------------------------------------|-------------|
| <i>Sketch of the Former for Rolling the Cases.</i>                             | <i>1</i>    |
| <i>Sketch of the Papers cut and laid down for Pasting.</i>                     | <i>2</i>    |
| <i>Sketch of the Paper and Former laid down for Rolling.</i>                   | <i>3</i>    |
| <i>Method of forming Bottoms to these Specchi Cases.</i>                       | <i>4</i>    |
| <i>Ditto with Sketches - - - - -</i>                                           | <i>5</i>    |
| <i>Sketch of the Gauge for cutting the Cases to an <sup>equal length</sup></i> | <i>6</i>    |
| <i>White Specchi Composition for Illuminated Wheels.</i>                       | <i>7</i>    |
| <i>White and Blue Composition for fixed Illuminations.</i>                     | <i>8</i>    |
| <i>Sketches of the Trammel, Drift and Mould for Filling.</i>                   | <i>9</i>    |
| <i>Method of Filling the Specchi Cases - - - - -</i>                           | <i>10</i>   |
| <i>Sketch complete of the Method of Filling - - - - -</i>                      | <i>11</i>   |
| <i>Method of Priming and Stringing the Specchis.</i>                           | <i>12</i>   |
| <i>Sketches of the Specchi bored and strung with twine.</i>                    | <i>13</i>   |
| <i>Large long Blue and Yellow Specchis - - - - -</i>                           | <i>14</i>   |
| <i>Composition for Yellow Specchis - - - - -</i>                               | <i>15</i>   |
| <i>Whole length of Specchis and their duration.</i>                            | <i>16</i>   |
| <i>Sketches of Specchis, exact size and length.</i>                            | <i>17</i>   |
| <i>Explanation of the Wheels in the - - - - -</i>                              | <i>18</i>   |
| <i>Sketches of two, Illuminated with Specchis.</i>                             | <i>19</i>   |

*Continued*

## INDEX Continued.

|                                                                             | Page |
|-----------------------------------------------------------------------------|------|
| <i>Explanation of the</i> - - - - -                                         | 20   |
| <i>Sketch of a Piece Illuminated with Speeches</i> - - -                    | 21   |
| <i>Explanation of the</i> - - - - -                                         | 22   |
| <i>Sketch of a Grand Crown, Illuminated Ditto</i> - - -                     | 23   |
| <i>Speeches of Colours, not yet discovered</i> - - -                        | 24   |
| <b>Leaders of all Sorts.</b>                                                |      |
| <i>Paper and Wire for Making of Leaders</i> - - -                           | 25   |
| <i>Method of Rolling tube paper Leaders</i> - - -                           | 26   |
| <i>Cartridge Paper Leaders and Wire</i> - - - - -                           | 27   |
| <i>Method of Rolling Cartridge paper Leaders</i> - - -                      | 28   |
| <i>Ditto continued, both for tube and Cartridge <sup>papers</sup></i> - - - | 29   |
| <i>Method of dry Rolling of Leaders</i> - - - - -                           | 30   |
| <i>Ditto continued both for plain &amp; trumpet mouths</i> - -              | 31   |
| <i>Application of the several sorts of Leaders</i> - - -                    | 32   |
| <i>Sketches of each sort of Leaders and Wires</i> - - -                     | 33   |
| <i>Receipt for making the Varnish for Fireworks</i> - -                     | 34   |
| <b>Marroons of each Nature</b> - - - - -                                    |      |
| <i>Dimensions of the several Natures of Marroons</i> - -                    | 36   |
| <i>Ditto. Continued with sketches</i> - - - - -                             | 37   |
| <i>Method of forming Bottoms to &amp; filling the Cases</i> - -             | 38   |
| <i>Method of forming tops to the Cases when filled</i> - -                  | 39   |
| <i>Method of Kitting the Line for Woolding</i> - - -                        | 40   |

# INDEX Continued.

|                                                                      | Page |
|----------------------------------------------------------------------|------|
| <i>Applications of each Nature of Marroons</i> . . . . .             | 41   |
| <i>Priming of Marroons, and making gun water</i> . . . . .           | 42   |
| <i>Composition for 2 dram Marroons and Mixing</i> . . . . .          | 43   |
| <i>Method of Covering Marroons with the Composition</i> . . . . .    | 44   |
| <i>Ditto continued and complicated</i> . . . . .                     | 45   |
| <i>Application of each Nature of Marroons continued</i> . . . . .    | 46   |
| <i>Sketch of the Rails for Batteries of Marroons</i> . . . . .       | 47   |
| <i>Method of Priming Marroons for Batteries</i> . . . . .            | 48   |
| <i>Sketches of the Method of Priming, &amp; papering</i> . . . . .   | 49   |
| <i>Method of Papering continued</i> . . . . .                        | 50   |
| <i>Sketch for Papering, and forming the tubes</i> . . . . .          | 51   |
| <i>Method of Rolling the tubes, with Sketches</i> . . . . .          | 52   |
| <i>Sketch of the tube quickmatched and tied in</i> . . . . .         | 53   |
| <i>Method of laying the Rails with quickmatch</i> . . . . .          | 54   |
| <i>Sketches of Cartouches and fixing them</i> . . . . .              | 55   |
| <i>Method of fixing the Marroons upon the Rails</i> . . . . .        | 56   |
| <i>Sketches for Complicating Batteries of Marroons</i> . . . . .     | 57   |
| <i>Method of covering the Rails with pasted paper</i> . . . . .      | 58   |
| <i>Method of driving the pickets, for fixing the Rails</i> . . . . . | 59   |
| <i>Sketches of the antique foldings of the Leaders</i> . . . . .     | 60   |
| <i>Pots de Brins.</i>                                                |      |
| <i>Sketches and Description of the Planks</i> . . . . .              | 61   |

# INDEX Continued.

| <i>Pots de Brins Continued.</i>                                    | <i>Page.</i> |
|--------------------------------------------------------------------|--------------|
| <i>Method of Laying the Planks with quickmatch</i>                 | 62           |
| <i>Of Leaders and Communications for the Planks</i>                | 63           |
| <i>Sketch of the Plank Communicated</i> . . .                      | 64           |
| <i>Sketch of the Former and Case Rolled</i> . . .                  | 65           |
| <i>Method of Rolling the Cases</i> . . . . .                       | 66           |
| <i>Ditto Continued</i> . . . . .                                   | 67           |
| <i>Ditto Continued</i> . . . . .                                   | 68           |
| <i>Sketch of the wood Nipple and Gauge for Choking</i>             | 69           |
| <i>Application of the wood Gauge and Nipple</i>                    | 70           |
| <i>Sketch and Dimensions of the Case Completed</i>                 | 71           |
| <i>Reason for leaving the Chokes of the Cases long</i>             | 72           |
| <i>Sketch of the Tube for Pots de Brins</i> . . . .                | 73           |
| <i>Method of making Champinions for</i> Ditto                      | 74           |
| <i>Sketch of a Champinion Completed</i> . . .                      | 75           |
| <i>Method of flutting the Champinions into the</i> <sup>Pots</sup> | 76           |
| <i>To Load the Pots with Stars, &amp; Compact them</i>             | 77           |
| <i>Sketch for Marking the Pots loaded with Stars</i>               | 78           |
| <i>Method of Loading the Pots with Rains</i> . .                   | 79           |
| <i>To Fix the Pots upon the Planks with glue</i>                   | 80           |
| <i>Sketch of a Pot de Brins Completed</i> . . .                    | 81           |
| <i>Sketch of two Planks fixed for Firing</i> . .                   | 82           |

# INDEX Continued.

## Pots de Saucissons.

|                                                                    | Page. |
|--------------------------------------------------------------------|-------|
| Sketch of an antique one with long Cases...                        | 83    |
| Description of the antique Pots .....                              | 84    |
| Sketches of the Champignons for the Pots .....                     | 85    |
| Method of putting the Champignons into the <sup>Pots</sup> .....   | 86    |
| To Load the Pots with 2 ounce Squibs or Sardons .....              | 87    |
| Fixing the Center Case, and pasting the top .....                  | 88    |
| Method of Fixing and communicating the <sup>Cases</sup> side ..... | 89    |
| Method of Preparing and driving the Cases .....                    | 90    |
| Driving the Cases continued .....                                  | 91    |
| Sketch of the Reamer for Boring the Cases .....                    | 92    |
| Priming the Cases and preparing the tubes .....                    | 93    |
| Length of tub., and to fix the Pots double <sup>tubes</sup> .....  | 94    |
| What the Pots are double Loaded with, and their .....              | 95    |
| Description of the Modern Pots .....                               | 96    |
| Sketches of the Modern Pots .....                                  | 97    |
| Description and Sketch of the Center Case .....                    | 98    |
| Method of Loading and Compleating the Pots .....                   | 99    |
| Sketch of a Post for Fixing the Pots on .....                      | 100   |
| Application and Method of Firing the Pots .....                    | 101   |
| Sketch of a Range of Bouquets and Pots .....                       | 102   |

## Pots de Airgrets.

|                                           |     |
|-------------------------------------------|-----|
| Sketches of the Pot and Center Case ..... | 103 |
|-------------------------------------------|-----|

## INDEX Continued.

| <i>Pots de Airgrets Continued.</i>                                                   | <i>Page.</i> |
|--------------------------------------------------------------------------------------|--------------|
| <i>Of the Cases; and Loading with Squibs or Stars</i>                                | 104          |
| <i>To Load; fix the Center Case and Complicat.</i>                                   | 106          |
| <i>Sketch of the Pot Complicated</i>                                                 | 106          |
| <i>Sketches of the Pot for screening the Pots on</i>                                 | 107          |
| <i>Conclusion of this Article</i>                                                    | 108          |
| <i>Air Balloons.</i>                                                                 |              |
| <i>Sketch of the wood Former for Rolling the</i> <sup><i>bases.</i></sup>            | 109          |
| <i>Method of Rolling the Bases explained</i>                                         | 110          |
| <i>Ditto Continued</i>                                                               | 111          |
| <i>Ditto Completed</i>                                                               | 112          |
| <i>Sketches of the wood Block, and brass Chamber</i>                                 | 113          |
| <i>Method of Fixing the bases on the Blocks</i>                                      | 114          |
| <i>Sketch of the base nailed on to the Block</i>                                     | 115          |
| <i>Method of Woolding the Cases, with the Sketch</i>                                 | 116          |
| <i>Woolding Continued</i>                                                            | 117          |
| <i>Woolding Continued and Completed</i>                                              | 118          |
| <i>Sketch of the Mortar completely Woolded</i>                                       | 119          |
| <i>Sketch and Description of the wood Shells</i>                                     | 120          |
| <i>Sketch of the Shell glued together &amp; Method of</i> <sup><i>Covering</i></sup> | 121          |
| <i>Method of Covering the wood Shell with Canvas</i>                                 | 122          |
| <i>Ditto, Covering with whitey brown paper</i>                                       | 123          |
| <i>Shells Completed; with a Sketch of the Fuze</i>                                   | 124          |
| <i>Method of Filling the Shells with Stars</i>                                       | 125          |

# INDEX Continued.

| Air Balloons Continued.                                            | Page. |
|--------------------------------------------------------------------|-------|
| Compleating with Stars, & glazing in the Fuzes                     | 126   |
| Glazing in the Fuzes & Filling Continued.                          | 127   |
| Method of Piercing the Fuzes, very exact                           | 128   |
| Ditto Continued, with particular attention                         | 129   |
| Method of securing the Priming, with Sketch                        | 130   |
| Sketches of the Shell, with the Fuse primed and <sup>applied</sup> | 131   |
| Cautions to be very carefull in priming the Fuzes                  | 132   |
| Looking out, and choosing the best Mortars.                        | 133   |
| Clearing the Vent of the brass Chamber & Block                     | 134   |
| Sketches of the Leaders for communicating the <sup>Block</sup>     | 135   |
| Sketch of the Mortar with the Leader fixed                         | 136   |
| Sketch, how to paste the Leader, and cut out circles               | 137   |
| Sketches for the top & inside circles of Cartrons                  | 138   |
| Application of the inside circles, with Sketch                     | 139   |
| Method of Loading the Mortars                                      | 140   |
| Ditto Continued                                                    | 141   |
| Method of pasting over the Mortars & <sup>thong</sup> furnishing   | 142   |
| Illuminated Air Balloons, Sketch of the wood Shell                 | 143   |
| Method of glazing; Filling; setting in the Fuzes &c.               | 144   |
| Preparing the filled Shells; Gum water &c.                         | 145   |
| Compositions for Illuminated Air Balloons                          | 146   |
| Method of Coating the Shells with Compositions                     | 147   |
| Ditto Continued                                                    | 148   |

## INDEX Continued.

| <i>Illuminated Air Balloons Continued.</i>                  | <i>Page.</i> |
|-------------------------------------------------------------|--------------|
| <i>Sketch and Use of the wood Gauge - - - - -</i>           | <i>149</i>   |
| <i>Coating with Composition and Compleating -</i>           | <i>150</i>   |
| <i>Time of Drying; and Loading the Mortars -</i>            | <i>151</i>   |
| <i>Sketches of the Mortars Compleated - - - - -</i>         | <i>152</i>   |
| <i>AIR BALLOONS for Signals; Sketch of the wood Form -</i>  | <i>153</i>   |
| <i>Of Cutting out the paper Patternes - - - - -</i>         | <i>154</i>   |
| <i>Method of Making the Oblong paper Cases -</i>            | <i>155</i>   |
| <i>Sketch of the Paper Shell compleated &amp; turned -</i>  | <i>156</i>   |
| <i>Sketch and Description of the Elm Bottoms -</i>          | <i>157</i>   |
| <i>Method of Boring the Elm Bottoms, &amp; Sketches -</i>   | <i>158</i>   |
| <i>Compleating the Bottoms &amp; filling in Fuxes -</i>     | <i>159</i>   |
| <i>Method of Priming the Bottoms, with Sketch -</i>         | <i>160</i>   |
| <i>Compleating the Bottoms, and Filling the Shells -</i>    | <i>161</i>   |
| <i>Method of Filling the Shells with Stars &amp;c. -</i>    | <i>162</i>   |
| <i>Ditto Continued - Corn Powder &amp; common Fire -</i>    | <i>163</i>   |
| <i>Method of gluing and Nailing on the wood Bottoms -</i>   | <i>164</i>   |
| <i>Securing and pasting over the wood Bottoms -</i>         | <i>165</i>   |
| <i>Pasting Compleated, with proportions &amp; Weights -</i> | <i>166</i>   |
| <i>Report of an Accident, through inattention -</i>         | <i>167</i>   |
| <i>Ditto continued; with the best Method of Loading -</i>   | <i>168</i>   |
| <i>Ditto continued; with a report of two Fired - -</i>      | <i>169</i>   |
| <i>Dimensions of a lesser Sort - Article Compleated -</i>   | <i>170</i>   |

# INDEX Continued.

277.

## Five Pointed Star Cases.

|                                                   | Page. |
|---------------------------------------------------|-------|
| Method of Rolling the Cases - pasted Cartoons     | 171   |
| Sketches of the used Hammer, Case rolled & Choked | 172   |
| Cutting the Cases to an equal length              | 173   |
| Sketch of the Pipe & end of the Drift for Claying | 174   |
| Of notched Brackets; and Claying the Cases        | 175   |
| Sketch of the Case clayed - full dimensions       | 176   |
| Composition for five pointed Star Cases           | 177   |
| Method of Driving the Cases with Composition      | 178   |
| Sketches of the Bits for Boreing the Cases        | 179   |
| Method of Marking off the Cases for Boreing       | 180   |
| Method of Boreing with the Bit                    | 181   |
| Method of Boreing with the gimble; & Sketches     | 182   |
| Pasting over the clayed ends of the Cases         | 183   |
| Description of the Brackets with Sketches         | 184   |
| Sketch of a Regulated Piece with 5 pointed Stars  | 185   |
| Sketch Ditto. with 6 Arms of Stars                | 186   |

## Cascade Cases.

|                                                 |     |
|-------------------------------------------------|-----|
| Method of Rolling; the same as for all Cartoons | 187 |
| Sketch of the Pipe & end method of Choking      | 188 |
| Compositions for Cascade Cases                  | 189 |
| Method of Mixing the Compositions               | 190 |
| Method of Driving the Cases                     | 191 |

## INDEX Continued.

## Cascade Cases Continued.

|                                                                                | Page. |
|--------------------------------------------------------------------------------|-------|
| Method of Driving Continued - - - - -                                          | 192   |
| Priming with quickmatch; & pasting the ends - - - - -                          | 193   |
| Preparing & fixing Marroons at the end of the, <sup>Cases</sup> - - - - -      | 194   |
| Section of a Case without a Marroon; Ditto with a <sup>Marroon</sup> - - - - - | 195   |
| Sketches of the Brackets; Description of the Planks - - - - -                  | 196   |
| Sketches of the Planks and Post with Braces - - - - -                          | 197   |
| Sketch of a Semicircular Cascade complete - - - - -                            | 198   |
| Method of Fixing and communicating the Planks - - - - -                        | 199   |
| Sketch of an Unique Circular Cascade - - - - -                                 | 200   |
| Pumps or Roman Candles.                                                        |       |
| Sketch and dimensions of the large Pump Case - - - - -                         | 201   |
| Method of Driving the Pump Cases - - - - -                                     | 202   |
| Section of a Case drove - - - - -                                              | 203   |
| Two Methods of Fixing the Cases - - - - -                                      | 204   |
| Sketch of a Balloon Wheel with description - - - - -                           | 205   |
| Sketch of the method of tying on & stringing the <sup>Cases</sup> - - - - -    | 206   |
| Sketch of a Fixt Piece with Pumps - - - - -                                    | 207   |
| Sketch Ditto - - - - - Ditto - - - - -                                         | 208   |

# INDEX Continued.

| <i>Wheels in Azure Fire.</i>                                               | <i>Page.</i> |
|----------------------------------------------------------------------------|--------------|
| <i>Sketches of the Wheel and Spindle Iron</i> . . . . .                    | 209          |
| <i>Sketches of the Wheel Block</i> . . . . .                               | 210          |
| <i>Sketch of the spokes, with Explanations</i> . . . . .                   | 211          |
| <i>Sketches of the Brackets for tying the cases on</i> . . . . .           | 212          |
| <i>Sketches of the brace plates and spindle iron</i> . . . . .             | 213          |
| <i>Fitting the Wheel to the spindle iron</i> . . . . .                     | 214          |
| <i>Sketch of a 3 ounce Wheel Case</i> . . . . .                            | 215          |
| <i>Sketches of the notched Brackets and Blocks</i> . . . . .               | 216          |
| <i>Sketches of the tin Laddes for driving 3 ounce Cases</i> . . . . .      | 217          |
| <i>Tin Laddes and Common fire for preparing Cases</i> . . . . .            | 218          |
| <i>Method of Preparing Wheel Cases</i> . . . . .                           | 219          |
| <i>Sketches of the iron Nipple and Block for Ditto</i> . . . . .           | 220          |
| <i>Sketch and use of the long hollow Drift for Ditto</i> . . . . .         | 221          |
| <i>Method of Preparing with the long hollow Drift</i> . . . . .            | 222          |
| <i>Cautions in preparing with the spindle &amp; hollow Drift</i> . . . . . | 223          |
| <i>Composition for Driving the Wheel Cases with</i> . . . . .              | 224          |
| <i>Method of Driving the Wheel Cases in the Brackets</i> . . . . .         | 225          |
| <i>Method of Driving the Wheel Cases on the Nipple</i> . . . . .           | 226          |
| <i>Sections of Cases drove in the Brackets &amp; Spindle</i> . . . . .     | 227          |
| <i>Boring and Priming the Cases drove in the Brackets</i> . . . . .        | 228          |
| <i>Sketch of the Cases quickmatched long and short</i> . . . . .           | 229          |

# INDEX Continued.

## *Wheels in Azure Fire Continued*

|                                                                        | Page. |
|------------------------------------------------------------------------|-------|
| <i>Sketches of Cases Cartouched long and short</i>                     | 230   |
| <i>Method of Communicating the Cases on Saucifur</i>                   | 231   |
| <i>Sketches for Communicating on Saucifur</i>                          | 232   |
| <i>Sketch of a Wheel with the Cases tied on</i>                        | 233   |
| <i>Method of tying the Cases on the Wheel</i>                          | 234   |
| <i>Method of tying on Continued</i>                                    | 235   |
| <i>Method of Pasting over the packthreads &amp; Cartouch</i>           | 236   |
| <i>Sketch of Ditto Continued</i>                                       | 237   |
| <i>Sketch of a Wheel with Cases tied on; 2<sup>d</sup> Method</i>      | 238   |
| <i>Explanation of the second Method</i>                                | 239   |
| <i>Preparing and tying in the short Communicat<sup>ions</sup></i>      | 240   |
| <i>Pasting and Compleating the Wheel Cases</i>                         | 241   |
| <i>Ditto Continued, and of the Blue Cases</i>                          | 242   |
| <i>Sketch and Dimensions of the Wnts Ditto</i>                         | 243   |
| <i>Sketches of Ripples, and notched Brackets</i>                       | 244   |
| <i>First Composition for driving the Blue Cases</i>                    | 245   |
| <i>Blue Composition and Method of Driving</i>                          | 246   |
| <i>Section of the Case drove, Quick matching &amp;c</i>                | 247   |
| <i>Sketch for tying on and stringing the blue Case</i>                 | 248   |
| <i>A Sketch of the Wheel compleated with Communi<sup>cations</sup></i> | 249   |

# INDEX Continued.

## *Wheels in Azure Fire Continued.*

|                                                                                 | Page |
|---------------------------------------------------------------------------------|------|
| Method of tying in and placing the fork leaders                                 | 250  |
| Description and Method of communicating the blue <sup>Effect</sup>              | 251  |
| Ditto continued with a Sketch of the joints . . .                               | 252  |
| A Sketch of the Method of placing the cross leaders                             | 253  |
| Further Explanation & Sketches for the cross leaders                            | 254  |
| Method of Fixing the cross leaders continued.                                   | 255  |
| Method of Pasting & Varnishing the Wheel . . .                                  | 256  |
| Method of Fixing the Wheel for Firing . . .                                     | 257  |
| Ditto continued with directions for Raising &c.                                 | 258  |
| Ditto continued, with Sketch of a Fork . . . . .                                | 259  |
| Fixing the Wheel and Stand with short pickets                                   | 260  |
| A Sketch of the Wheel first complete for Firing . .                             | 261  |
| Remarks on the Blue Composition . . . . .                                       | 262  |
| <i>Rayonnant or White Fire .</i>                                                |      |
| Rayonnant Fire, the same as the first composition <sup>for the Blue bases</sup> | 263  |
|                                                                                 | 264  |
|                                                                                 | 265  |
|                                                                                 | 266  |
|                                                                                 | 267  |
|                                                                                 | 268. |

50  
3

